BOOK 3
DETAILED SPECIFICATIONS

111TH STREET AND COTTAGE GROVE AVENUE IMPROVEMENTS
111TH STREET FROM MARTIN LUTHER KING JR. DRIVE TO DOTY/CORLISS AVENUE
COTTAGE GROVE AVENUE FROM 111TH STREET TO 108TH STREET

CDOT PROJECT NO.: S-0-450
SPECIFICATION NO.: 1265409

CITY OF CHICAGO
BRANDON JOHNSON
MAYOR

Prepared by
DEPARTMENT OF TRANSPORTATION (CDOT)
Contracts Section

THOMAS CARNEY
Commissioner of Department of Transportation
2 North LaSalle Street, Suite 1110
Chicago, Illinois 60602-2570

VIGNESH KRISHNAMURTHY
Managing Deputy Commissioner
Division of Project Development

Issued by the
DEPARTMENT OF PROCUREMENT SERVICES

AILEEN VELAZQUEZ
Acting Chief Procurement Officer

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All Signatures To Be Sworn To Before A Notary Public

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1407 POLE MOUNTED CAST ALUMINUM JUNCTION BOX FOR TRAFFIC SIGNALS
1428 THERMAL MAGNETIC CIRCUIT BREAKER
1443 SECONDARY RACK, 2 OR 3 WIRE, WITH INSULATORS
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SECTION I

GENERAL INFORMATION

DETAILED SPECIFICATIONS
FOR
COTTAGE GROVE AVENUE AND 111TH STREET IMPROVEMENTS
COTTAGE GROVE AVENUE FROM 108TH STREET TO 111TH STREET
111TH STREET FROM MARTIN LUTHER KING JR. DRIVE TO COTTAGE GROVE AVENUE

C.D.O.T PROJECT NO. S-0-450

GENERAL INFORMATION

The following Detailed Specifications supplement the "Standard Specifications for Road and Bridge Construction", adopted January 1, 2022, by the Illinois Department of Transportation (hereinafter referred to as the Standard Specifications or the SSRBC); the "Supplemental Specifications and Recurring Special Provisions", adopted January 1, 2023, indicated on the Check Sheets; the latest edition of the "Illinois Manual on Uniform Traffic Control Devices for Streets and Highways" in effect on the date of invitation for bids which apply to and govern this project; the Chicago Department of Transportation Regulations for Openings, Construction, and Repair in the Public Way (including Appendix B - ADA Standards, found on CDOT's website) in effect on the date of invitation for bids; and the "Manual of Test Procedures for Materials" in effect on the date of invitation of bids, included herein which apply to and govern this project. In case of conflict with any part or parts of said specifications, these Details Specifications will take precedence and shall govern.

Any references in these Detailed Specifications to "the Engineer" will read "the Commissioner, Department of Transportation, City of Chicago" (Commissioner), and any reference to the "Department" will read "Chicago Department of Transportation, Division of Project Development" (CDOT).

The following specifications from the City of Chicago are applicable: Standard Specification for Sewer Construction, Department of Water Management, and the Division of Electrical Operations Standard Specifications.

DESIGNATION OF ITEMS OF WORK

The items of work contained in the schedule of prices in the proposal form for this project are designated by number and description and must conform to the provisions contained in these detailed specifications.

Unless otherwise specified, the Description, General Requirements, Method of Measurement, and Basis of Payment for the following items will be as stated in the appropriate sections of the Standard Specifications.

DESCRIPTION OF WORK

The work consists of furnishing all labor, materials and equipment required for the 111th Street and Cottage Grove Avenue Improvements.

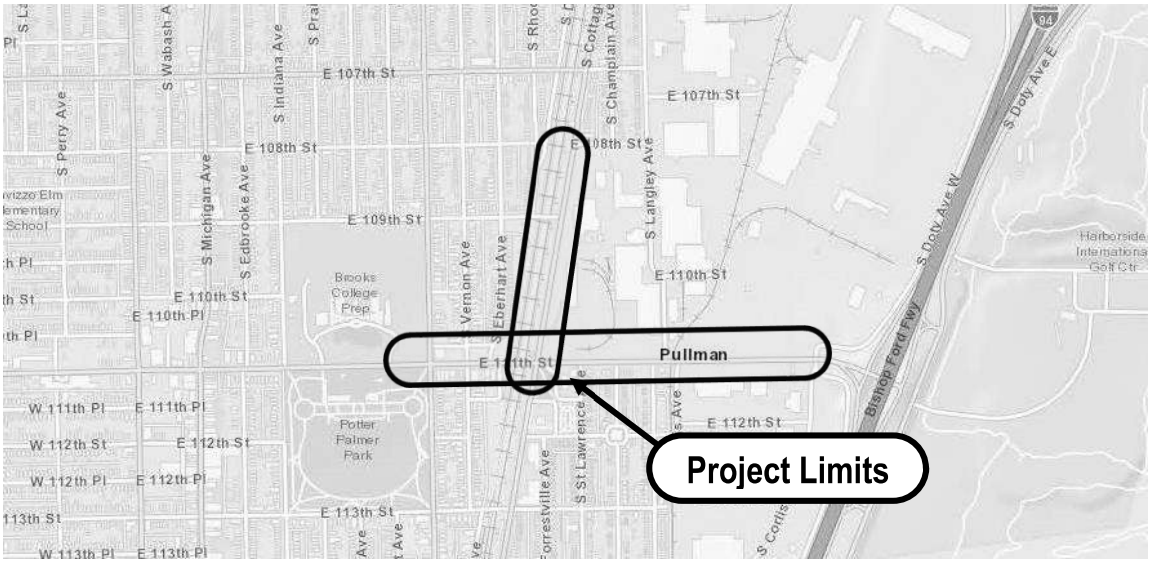
This includes but is not limited to the following activities: : asphalt surface removal, full-depth removal of existing roadway pavement, sidewalk removal, driveway pavement removal, concrete curb and gutter removal, excavation, granular sub-base, P.C.C. base course, HMA binder and surface course, combination curb and gutter, concrete sidewalk, ADA sidewalk ramps, P.C.C. driveway pavement, P.C.C. raised crosswalks, pedestrian refuge islands, bus boarding islands, catch basin and sewer lateral replacement, adjustment of existing drainage and utility structures,

new street lighting, topsoil sodding, new parkway trees and planters, signage, and pavement markings; as described in the detail specifications, including all appurtenant work and accessories, to the complete satisfaction of, approval and acceptance by the City.

This description of work is intended to be general in nature and is neither a complete description nor a limitation on the work to be performed. Contractor shall perform all Work described in the Contract Documents or reasonably inferable as necessary to produce the results specified therein, except to the extent specifically indicated in the Contract Documents to be the responsibility of others.

LOCATION OF PROJECT

This project is located along 111th Street from Martin Luther King Jr. Drive to Doty/Corliss Avenue and along Cottage Grove Avenue from 111th Street to 108th Street.



MAINTENANCE OF TRAFFIC

The Contractor must, at all times, conduct the work in such a manner as to insure the least obstruction to vehicular and pedestrian traffic. The Contractor must provide all temporary facilities necessary, including all detour and traffic staging related items specified in the plans and/or details, to maintain vehicular and pedestrian traffic and access to all property to the satisfaction of the Commissioner. Traffic control devices, conforming to Illinois Department of Transportation Standards, must be placed as shown on the Standard Drawings at the end of the plans entitled Traffic Control Standards. This work will be included in “VEHICLE TRAFFIC CONTROL AND PROTECTION” AND “PEDESTRIAN TRAFFIC CONTROL AND PROTECTION”

LIST OF STANDARD PAY ITEMS AND SPECIAL PROVISIONS

Standard Specifications

The following Detailed Specifications supplement the "Standard Specifications for Road and Bridge Construction", adopted January 1, 2022, by the Illinois Department of Transportation (hereinafter referred to as the Standard Specifications or the SSRBC); the "Supplemental Specifications and Recurring Special Provisions", adopted January 1, 2023, indicated on the Check Sheets; the latest edition of the "Illinois Manual on Uniform Traffic Control Devices for Streets and Highways" in effect on the date of invitation for bids which apply to and govern this project; the Chicago Department of Transportation Regulations for Openings, Construction, and Repair in the Public Way (including Appendix B - ADA Standards, found on CDOT's website) in effect on the date of invitation for bids; and the "Manual of Test Procedures for Materials" in effect on the date of invitation of bids, included herein which apply to and govern this project. In case of conflict with any part or parts of said specifications, these Details Specifications will take precedence and shall govern.

Special Provision (SP) Note:

Y — Denotes items with contract or project specific special provisions, and/or conforms to IDOT Recurring Special Provisions and IDOT Bureau of Design & Environment (BDE) Special Provisions.

N — Denotes items which conform to the Illinois Department of Transportation "Standard Specifications for Road and Bridge Construction", adopted April 1, 2016 or the latest edition of the Supplemental Specifications. The SSRBC specifications included in the table below are incorporated by reference.

IDOT Standard Specifications Coded Pay Item Index:

No. 201---- to No. 671---- Road and Bridge Construction Items

No. 701---- to No. 783---- Traffic Control, Signing, Pavement Marking

No. Z------- to No. Z------- Special Pay Items

No. XX----- to No. XX------ Local Roads Temporary Pay Items

No. XZ----- to No. XZ------ Design Temporary Pay Items

"CDOT-----" Indicates CDOT special provision

" ******** " Indicates project-specific special provision

Typical Example and Digit Breakdown of a Coded Pay Item:

CODE NO.	ITEM DESCRIPTION
20100110	TREE REMOVAL (6 TO 15 UNITS DIAMETER)

201 - First 3 digits indicate the section in the Standard Specifications.
00110 - Last 5 digits indicate the numerical sequence the item has in that section.

ITEM NO.	SP REQ'D	CODE NO.	ITEM DESCRIPTION	PAGE NO.
1	Y	********	AIR EXCAVATION	DS-2
2	Y	*********	SOIL CONDITIONER - 3 INCH	DS-3
3	Y	CDOT2010010	ROOT PRUNING	DS-4
4	Y	CDOT2010020	TREE PROTECTION	DS-6
5	Y	CDOT2010030	TREE REMOVAL (1 TO 6 UNITS DIAMETER)	DS-10
6	N	20100110	TREE REMOVAL (6 TO 15 UNITS DIAMETER)	
7	N	20100210	TREE REMOVAL (OVER 15 UNITS DIAMETER)	
8	N	20101300	TREE PRUNING (1 TO 10 INCH DIAMETER)	
9	N	20101350	TREE PRUNING (OVER 10 INCH DIAMETER)	
10	N	20200100	EARTH EXCAVATION	
11	N	20201200	REMOVAL AND DISPOSAL OF UNSUITABLE MATERIAL	
12	N	20700110	POROUS GRANULAR EMBANKMENT	
13	Y	CDOT2070020	POROUS GRANULAR EMBANKMENT, SUBGRADE	DS-11
14	N	20800150	TRENCH BACKFILL	
15	Y	CDOT2110010	PULVERIZED TOPSOIL MIX	DS-13

16	**Y**	********	CDOT STRUCTURAL SOIL	DS-14
17	N	25100630	EROSION CONTROL BLANKET	
18	N	25200110	SODDING, SALT TOLERANT	
19	N	25200200	SUPPLEMENTAL WATERING	
20	N	28000250	TEMPORARY EROSION CONTROL SEEDING	
21	N	28000510	INLET FILTERS	
22	N	31101100	SUBBASE GRANULAR MATERIAL, TYPE B	
23	N	31101200	SUBBASE GRANULAR MATERIAL, TYPE B 4"	
24	N	31101400	SUBBASE GRANULAR MATERIAL, TYPE B 6"	
25	N	35300400	PORTLAND CEMENT CONCRETE BASE COURSE 9"	
26	N	40600290	BITUMINOUS MATERIALS (TACK COAT)	
27	N	40600400	MIXTURE FOR CRACKS, JOINTS AND FLANGEWAYS	
28	N	40600901	HOT-MIX ASPHALT BINDER COURSE (HAND METHOD), N70	
29	N	40602985	HOT MIX ASPHALT BINDER COURSE, IL-9.5, N70	
30	N	40604062	HOT-MIX ASPHALT SURFACE COURSE, IL-9.5, MIX "D", N70	
31	N	42001100	HIGH-EARLY-STRENGTH PORTLAND CEMENT CONCRETE PAVEMENT 10"	
32	**Y**	********	BUS PAD PCC PAVEMENT, 12" (HES)	DS-17
33	N	42001300	PROTECTIVE COAT	
34	**Y**	CDOT4230010	HIGH-EARLY-STRENGTH PORTLAND CEMENT CONCRETE DRIVEWAY PAVEMENT 8 INCH	DS-19
35	**Y**	CDOT4230030	HIGH-EARLY-STRENGTH PORTLAND CEMENT CONCRETE ALLEY PAVEMENT 8 INCH	DS-20
36	**Y**	CDOT4240010	PORTLAND CEMENT CONCRETE SIDEWALK 5 INCH	DS-21
37	**Y**	********	PORTLAND CEMENT CONCRETE SIDEWALK 8 INCH	DS-21
38	**Y**	CDOT4240040	PORTLAND CEMENT CONCRETE ADA RAMP 8 INCH	DS-22
39	**Y**	CDOT4240055	LINEAR DETECTABLE WARNING TILES (CAST IRON)	DS-23
40	**Y**	CDOT4240065	RADIAL DETECTABLE WARNING TILES (CAST IRON)	DS-23
41	**Y**	CDOT4240070	PROPERTY LINE CURB	DS-24
42	N	44000100	PAVEMENT REMOVAL	
43	**Y**	CDOT4400010	HOT-MIX ASPHALT SURFACE REMOVAL, VARIABLE DEPTH	DS-25
44	**Y**	X4400100	PORTLAND CEMENT CONCRETE SURFACE REMOVAL (VARIABLE DEPTH)	DS-26
45	**Y**	********	DRIVEWAY AND ALLEY PAVEMENT REMOVAL	DS-27
46	N	44000300	CURB REMOVAL	
47	N	44000500	COMBINATION CURB AND GUTTER REMOVAL	
48	**Y**	********	SIDEWALK REMOVAL	DS-28
49	N	44201341	CLASS C PATCHES, TYPE II, 9 INCH	
50	N	44201345	CLASS C PATCHES, TYPE III, 9 INCH	
51	N	44201347	CLASS C PATCHES, TYPE IV, 9 INCH	
52	N	44201753	CLASS D PATCHES, TYPE II, 9 INCH	
53	N	44201757	CLASS D PATCHES, TYPE III, 9 INCH	
54	N	44201759	CLASS D PATCHES, TYPE IV, 9 INCH	
55	**Y**	********	STORM SEWERS, TYPE 2, 8-INCH (EXTRA STRENGTH VITRIFIED CLAY PIPE)	DS-29
56	**Y**	********	STORM SEWERS, TYPE 2, 8-INCH (DUCTILE IRON PIPE)	DS-29
57	**Y**	********	PLUG EXISTING SEWER	DS-31
58	**Y**	CDOT6020010	CATCH BASINS, TYPE A, 4'-DIAMETER, TYPE 1 FRAME, OPEN LID (CITY OF CHICAGO)	DS-32
59	**Y**	CDOT6020020	INLETS, TYPE A, TYPE 1 FRAME, OPEN LID (CITY OF CHICAGO)	DS-32
60	**Y**	********	REMOVING MANHOLES	DS-33
61	**Y**	CDOT6050020	REMOVING CATCH BASINS	DS-33
62	**Y**	CDOT6050030	REMOVING INLETS	DS-33

63	Y	********	FRAMES AND LIDS (CITY OF CHICAGO)	DS-34
64	Y	********	ADDITIONAL MASONRY	DS-35
65	Y	********	TELEVISE EXISTING STORM SEWER, 12 INCH	DS-36
66	Y	********	TELEVISE EXISTING STORM SEWER, 15 INCH	DS-36
67	Y	********	TELEVISE EXISTING STORM SEWER, 24 INCH	DS-36
68	Y	********	TELEVISE EXISTING STORM SEWER, 30 INCH	DS-36
69	Y	********	TELEVISE EXISTING STORM SEWER, 36 INCH	DS-36
70	Y	********	TELEVISE EXISTING STORM SEWER, 48 INCH	DS-36
71	Y	********	TELEVISE EXISTING STORM SEWER, 54 INCH	DS-36
72	Y	********	TELEVISE EXISTING STORM SEWER, 72 INCH	DS-36
73	Y	********	TELEVISE EXISTING STORM SEWER, 78 INCH	DS-36
74	N	60600605	CONCRETE CURB, TYPE B	
75	Y	CDOT6060020	COMBINATION CONCRETE CURB AND GUTTER, TYPE B-V.12	DS-39
76	Y	X6061902	CONCRETE MEDIAN, TYPE SM (SPECIAL)	DS-40
77	Y	********	CONCRETE MEDIAN SURFACE, 8-INCH	DS-40
78	N	66900200	NON-SPECIAL WASTE DISPOSAL	
79	N	66900530	SOIL DISPOSAL ANALYSIS	
80	N	66901001	REGULATED SUBSTANCES PRE-CONSTRUCTION PLAN	
81	N	66901003	REGULATED SUBSTANCES FINAL CONSTRUCTION REPORT	
82	N	66901006	REGULATED SUBSTANCES MONITORING	
83	Y	CDOT6700010	ENGINEER'S FIELD OFFICE	DS-42
84	N	67100100	MOBILIZATION	
85	Y	********	VEHICLE TRAFFIC CONTROL AND PROTECTION	DS-44
86	Y	********	PEDESTRIAN TRAFFIC CONTROL AND PROTECTION	DS-48
87	Y	********	MAINTENANCE OF ACCESS TO ABUTTING PROPERTY	DS-52
88	N	70107004	PAVEMENT MARKING BLACKOUT TAPE, 4"	
89	N	70107006	PAVEMENT MARKING BLACKOUT TAPE, 6"	
90	N	70107012	PAVEMENT MARKING BLACKOUT TAPE, 12"	
91	N	70107024	PAVEMENT MARKING BLACKOUT TAPE, 24"	
92	N	70107025	CHANGEABLE MESSAGE SIGN	
93	N	70300150	SHORT TERM PAVEMENT MARKING REMOVAL	
94	N	70300211	TEMPORARY PAVEMENT MARKING LETTERS AND SYMBOLS - PAINT	
95	N	70300221	TEMPORARY PAVEMENT MARKING - LINE 4" - PAINT	
96	N	70300241	TEMPORARY PAVEMENT MARKING - LINE 6" - PAINT	
97	N	70300821	TEMPORARY PAVEMENT MARKING - LINE 24" - PAINT	
98	Y	70307100	TEMPORARY PAVEMENT MARKING LETTERS AND SYMBOLS - TYPE IV TAPE	DS-54
99	Y	70307120	TEMPORARY PAVEMENT MARKING - LINE 4" - TYPE IV TAPE	DS-54
100	Y	70307130	TEMPORARY PAVEMENT MARKING - LINE 6" - TYPE IV TAPE	DS-54
101	Y	70307210	TEMPORARY PAVEMENT MARKING - LINE 24" - TYPE IV TAPE	DS-54
102	Y	X7030005	TEMPORARY PAVEMENT MARKING REMOVAL	DS-54
103	N	70400100	TEMPORARY CONCRETE BARRIER	
104	N	70400200	RELOCATE TEMPORARY CONCRETE BARRIER	
105	N	70600255	IMPACT ATTENUATORS, TEMPORARY (FULL REDIRECTIVE, NARROW), TEST LEVEL 2	
106	N	70600320	IMPACT ATTENUATORS, RELOCATE (FULLY REDIRECTIVE), TEST LEVEL 2	
107	Y	Z0062456	TEMPORARY PAVEMENT	DS-55
108	N	78000100	THERMOPLASTIC PAVEMENT MARKING - LETTERS AND SYMBOLS	
109	N	78000200	THERMOPLASTIC PAVEMENT MARKING - LINE 4"	
110	N	78000400	THERMOPLASTIC PAVEMENT MARKING - LINE 6"	
111	N	78000600	THERMOPLASTIC PAVEMENT MARKING - LINE 12"	
112	N	78000650	THERMOPLASTIC PAVEMENT MARKING - LINE 24"	

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114	Y	********	METHYL METHACRYLATE PAVEMENT COLORIZATION, WHITE	DS-56
115	Y	********	METHYL METHACRYLATE PAVEMENT COLORIZATION, YELLOW	DS-56
116	N	78008210	POLYUREA PAVEMENT MARKING TYPE I - LETTERS AND SYMBOLS	
117	N	78008210	POLYUREA PAVEMENT MARKING TYPE I - LINE 4"	
118	N	78008230	POLYUREA PAVEMENT MARKING TYPE I - LINE 6"	
119	N	78008250	POLYUREA PAVEMENT MARKING TYPE I - LINE 12"	
120	N	78008270	POLYUREA PAVEMENT MARKING TYPE I - LINE 24"	
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122	Y	********	REMOVE AND SALVAGE SIGN PANEL	DS-59
123	Y	********	REMOVE EXISTING SIGN PANEL AND POST ASSEMBLY AND SALVAGE	DS-59
124	Y	********	FURNISH AND INSTALL POLE AND BASE	DS-60
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126	Y	********	SIGN PANEL - TYPE 1 - RETROREFLECTIVE - TYPE A - DOUBLE-SIDED	DS-63
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129	Y	********	TUBULAR FLEXIBLE DELINEATOR	DS-67
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131	Y	********	REMOVE BENCH	DS-69
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133	Y	********	REMOVE TRASH RECEPTACLE	DS-71
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136	Y	X0426200	DEWATERING	DS-73
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139	Y	Z0018500	DRAINAGE STRUCTURES TO BE CLEANED	DS-77
140	Y	Z0018905	DRILL AND GROUT BARS	DS-78
141	Y	Z0036200	PAINT CURB	DS-79
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144	Y	********	CLAY BRICK PAVERS	DS-91
145	Y	********	CONCRETE PAVERS, TYPE 1 (FURNISH ONLY)	DS-100
146	Y	********	CONCRETE PAVERS, TYPE 2 (FURNISH ONLY)	DS-100
147	Y	********	CLAY BRICK PAVERS (FURNISH ONLY)	DS-100
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150	Y	********	BIKE RACK	DS-103
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154	Y	********	HANDHOLE, HEAVY DUTY, 36" X 36" WITH 24" FRAME AND LID	DS-107
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160	Y	********	GALVANIZED STEEL CONDUIT ATTACHED TO STRUCTURE 3/4"	DS-113
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SECTION II

DETAILED SPECIAL PROVISIONS

ITEM 1 - ****** - AIR EXCAVATION**

Work under this item shall be performed in accordance with Section 200 of the Standard Specifications for Road and Bridge Construction except as modified herein.

Description: This work shall consist of loosening soil within the designated TREE PROTECTION limits for existing trees in tree pits, as a preparation for incorporating SOIL CONDITIONER and installing plant material. This work does not apply to existing trees in grass parkways.

Submittals: The Contractor shall submit a Schedule of Work to the Commissioner for approval prior to any work related to this item.

General Requirements: Air Spade tool shall have a 150 scfm/90 psig nozzle attachment that is compatible for use with a standard air compressor. Air spade handle shall have sturdy handle, including a dead man trigger and guard, with industry standard air hose coupling. The nozzle end shall have stone guard and supersonic type nozzle head.

A. Proper safety apparel shall be worn during AIR EXCAVATION as specified by the air spade manufacturer.
B. Excavated soil shall remain in place. Contractor shall submit airborne soil containment plans which are incidental to AIR EXCAVATION. The contractor will be responsible for cleaning any dust or dirt off the adjacent traffic lanes or properties. Daily cleaning of the work zone shall not be paid for separately but considered incidental to this pay item.
C. Perform air spading (and incidental tree growth regulator application) in Spring only, after the trees have leafed out and before the end of May.
D. Using the air spade, excavate to 3-4" below the existing grades and to TREE PROTECTION limits.
E. Contractor shall immediately incorporate SOIL CONDITIONER (by hand) to final grade, so as not to expose the existing roots overnight.
F. No more than one block of area may be air spaded at a time without prior approval from the Commissioner.
G. Apply Cambistat tree growth regulator, per manufacturer's recommended directions, after air spading, arborist inspection, and root pruning are completed.

Method of Measurement: AIR EXCAVATION will be measured for payment per square yard of TREE PROTECTION limits as shown in the Schedule for Unit Prices for AIR EXCAVATION.

Basis of Payment: AIR EXCAVATION will be paid for at the contract unit price per square yard of TREE PROTECTION limits as shown in the Schedule for Unit Prices for AIR EXCAVATION. Any chemical applications related to the performance of AIR EXCAVATION shall be considered incidental to the cost of AIR EXCAVATION.

ITEM 2 - ****** - SOIL CONDITIONER – 3 INCH**

Description: This work shall consist of preparation of soil to receive soil amendments, placement and incorporation of soil conditioner, a soil amendment, into areas within the drip line of existing trees in tree pits. This work does not apply to existing trees in grass parkways.

General Requirements: Soil conditioner shall be a till-in mix/mulch that consists of 1/2" Southern Pine Bark Fines, Compost, Leaf Mulch, Hardwood Fines, Iron Sulfate, Blue Chip, Gypsum, with added Mycorrhizae.

Preparation: Do not begin soil conditioner installation until tree removals, planting soil installation, and curb installation and backfill are completed outside of the tree protection areas and tree protection fencing is removed within the tree protection areas.

In planting zones located under existing trees in enlarged tree pits within the tree protection area, remove existing turf or vegetation. Use total herbicide product, applied with manufacturer's recommended rate for turf removal. Protect trees and surrounding plantings from drift and apply within temperature and weather parameters recommended by the manufacturer. Reapply total herbicide again in 7-14 days, as needed to kill turf and other vegetation.

Begin soil conditioner installation no sooner than 14 days after the last herbicide application. Prepare soil surface with AIR EXCAVATION, by gently loosening the top 3"-6" of the existing soil. Excess herbicide-treated plant material may be removed and disposed of off site.

Apply 3" of SOIL CONDITIONER within tree protection area planting zone and incorporate into soil loosened by AIR EXCAVATION.

Method of Measurement: SOIL CONDITIONER - 3 INCH will be measured in place and the volume computed in square yards, prior to incorporation into existing soil.

Basis of Payment: The work under this item will be paid for at the contract unit price per cubic yard as shown in the Schedule of Unit Prices for SOIL CONDITIONER - 3 INCH, which price will be payment in full for completing the work as specified. All turf vegetation removal required for installation of SOIL CONDITIONER - 3 INCH is considered incidental to this item.

ITEM 3 - CDOT2010010 - ROOT PRUNING

Effective: June 1, 2008
Revised: March 21, 2022

Description: Work under this item shall consist of root pruning existing trees, at locations indicated on the plans or as directed by the Commissioner. Work under this item shall be performed with Article 201.06 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

General Requirements: The root pruning shall be performed or directly supervised by an International Society of Arboriculture (ISA) Certified Arborist, using a mechanical saw.

Root pruning shall occur:

- Immediately prior to construction of any formwork for curb, driveway or sidewalk.
- Immediately prior to any excavation of soil, concrete or other material adjacent to the tree protection fencing.
- When roots are damaged or torn inadvertently during construction, and shall be backfilled immediately.

The depth of root pruning shall not exceed the depth required for installation of the hardscape or excavation.

A permit for tree work shall be obtained from the Department of Streets and Sanitation, Bureau of Forestry (BOF).

Submittals: The Contractor shall submit the following to the Commissioner at least 30 days prior to commencing the work:

- The Certified Arborist certification.
- A report prepared by the Certified Arborist, including:
  - An assessment of quantity and size of trees to be root pruned.
  - Vertical location of tree roots.
  - A confirmation that less than one third of the trees' structural roots will be pruned.
  - A disclosure of trees anticipated to be pruned on more than one side.
  - A schedule of work.
  - A schedule of watering.

A copy of the report shall be provided to BOF for their approval.

Construction Requirements: Dimensions for root pruning of the existing trees along the proposed back of curb, driveway, sidewalk or other new construction shall be according to the following:

1. **Small Trees (<10" D.B.H.):** Unless noted otherwise, the root pruning trench shall offset no more than 1 foot from the back of the proposed new construction. The length of root pruning shall not be less than 5 feet on each side of the centerline of the tree.

2. **Medium Trees (10"-15" D.B.H.):** Unless noted otherwise, the root pruning trench shall be offset no more than 1 foot from the back of the new construction. The length of root pruning shall not be less than 10 feet on each side of the centerline of the tree.

3. **Large Trees (>15" D.B.H.):** Unless noted otherwise, the root pruning trench shall be offset no more than 1 foot from the back of the new construction. The length of the root pruning shall not be less than 15 feet on each side of the centerline of the tree.

D.B.H. (Diameter at Breast Height) represents the caliper measurement of the tree at 4'6" above the ground line.

Supplemental watering shall occur at a rate of 2 gallons per square foot of surface area within the root zone of plant material having sustained damage to the root zone and/or root pruning, within 24 hours of root pruning and twice weekly thereafter. Supplemental watering shall continue for a period of 90 days after completion of root pruning.

Method of Measurement: ROOT PRUNING will be measured for payment in feet, along the top of the ground line.

Basis of Payment: This work will be paid at the contract unit price per foot for ROOT PRUNING.

ITEM 4 - CDOT2010020 - TREE PROTECTION

Effective: May 30, 2007
Revised: March 21, 2022

Work under this item must be performed in accordance with Section 201 of the Standard Specifications and Chapter 10-32 of the Municipal Code except as herein modified.

Description: This item consists of the protection of trees from damage by the Contractor's equipment and operations during construction at locations shown on the plans or as directed by the Commissioner.

Method of Construction:

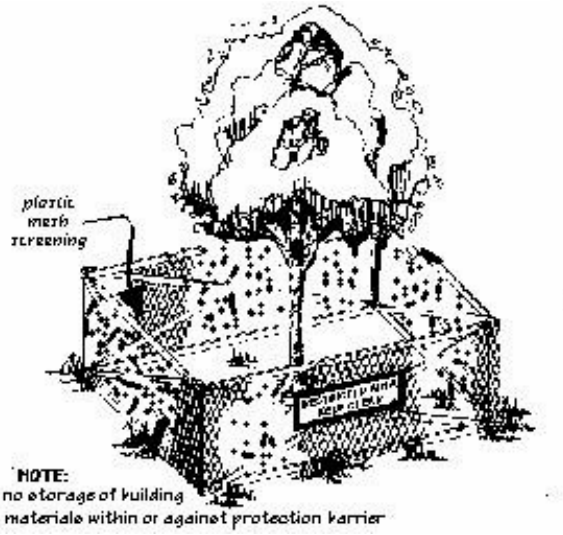
Tree Trunk Protection. The Contractor shall provide 2 inches by 8 inches by 8 foot boards, banded continuously around each trunk to prevent scarring of trees shown on the plans or designated by the Commissioner. For multi-stem trees, saplings, and shrubs to be protected within the area of construction, temporary fencing may be used for trunk protection.

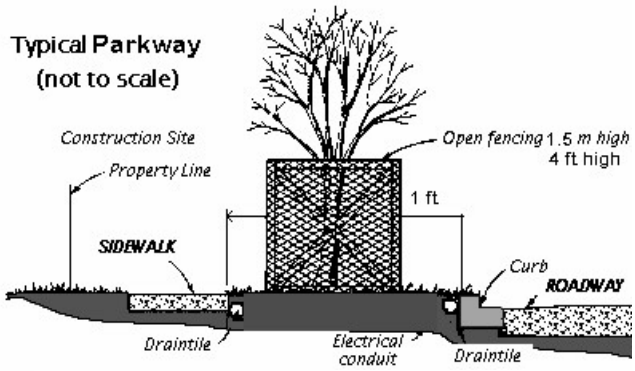
The Contractor shall repair or replace any and all damaged plant material determined by the Commissioner to any existing or newly installed plant material at its own expense. Unnecessary damage to ground cover or turf shall be repaired or replaced as specified for restoration of similar areas within the plans, or as directed by the Commissioner, and shall be at the Contractor's expense.

Root Zone Protection. During the entire construction period all reasonable efforts shall be made to protect from damage those trees and their root system designated to remain. Around the trees to be protected, the Contractor shall avoid excessive excavation or compaction and damage during the removal of trees and shrubs designated to be removed. All plant material designated to be saved, or outside of the limits of construction, shall be protected during subsequent construction work. Work under these items will include construction and maintenance of temporary fencing to protect the root zones of existing trees and other plantings, construction and maintenance of tree trunk protection. A protection barrier or temporary fence of at least 4 feet in height shall be installed around each tree to be protected and preserved. The tree protection shall be installed prior to the actual construction start and maintained for the duration of the project.

Within this protection zone, construction materials shall not be stored, equipment operated and/or temporary storage buildings or work trailers placed.

The protection barrier shall be constructed of orange snow fencing securely fastened to fence posts spaced a maximum **5 feet** on center. Posts are 6 feet in length with 2 feet set into the ground and 4 feet extending above ground. The fencing shall be attached to the post with a minimum of four (4) nylon-locking ties evenly spaced at each post.





Dimensions of the protection barrier are as follows:

Trees located in Tree Pits:

Where trees are located within Tree Pits, the fencing should be installed at a minimum distance of the inside dimension of the Tree Pit opening with one stake at each corner of the opening.

Trees Located in Parkways or Boulevards:

Small Trees (<9" D.B.H.): Minimum 5 feet from face of tree along the parkway length. In the dimension bordered by the public sidewalk or curb, the fencing shall be the width of the grass parkway with a maximum offset of 1 foot from back of curb or edge of sidewalk. In no case shall the closure be less than 2 feet from the centerline of the tree. (Example: 6" Tree in a 6' parkway as measured from back of curb to sidewalk. The dimension of the protection fencing would be 4' x 10' with tree in the center). Note: Larger grass parkways (>12') may allow for a ten-foot by ten foot (10' x 10').

Medium (10"to 15" D.B.H.): Minimum of 10 feet from face of tree along the parkway length. In the dimension bordered by the public sidewalk or curb, the fencing shall be the width of the grass parkway with a maximum offset of 1 foot from back of curb or edge of sidewalk. In no case shall the closure be less than 2 feet from the centerline of the tree.

Large (>15" D.B.H.): Minimum of 15 feet from face of tree along the parkway length. In the dimension bordered by the public sidewalk or curb, the fencing shall be the width of the grass parkway with a maximum offset of 1 foot from back of curb or edge of sidewalk. In no case shall the closure be less than 2 feet from the centerline of the tree.

The Contractor shall be responsible to protect all trees from damage at the construction site in accordance with Municipal Code Title 10 Chapter 32. It shall be the responsibility of the Contractor to restore all damaged parkways to their original condition. Any trees damaged as a result of construction activity as determined by the, Department of Streets and Sanitation, Bureau of Forestry, shall be repaired, removed and/or replaced at the Contractor's expense. The Contractor as specified in the Municipal Code shall pay liquidated damages in the amount of the appraised value of the tree(s).

At a minimum, any tree greater than 4" D.B.H. that is permanently damaged due to the construction project and not originally marked for removal shall be replaced with a new tree as identified by the Bureau of Forestry and shall have a minimum of 4" caliper B&B. Any damaged tree smaller than 4" caliper measured 6" above the ground shall be replaced in kind, inch for inch.

Root pruning: Root pruning associated with this item shall take place only where the roots of existing trees have been damaged by the Contractor during construction of the Project, as directed by the Commissioner.

If construction is to occur within the root zone of existing plant material, root pruning and special plant care including fertilizing and watering will be required, as directed by the Commissioner and hereinafter specified. Prior to root pruning, remove all weeds growing in existing tree mulch rings. Root pruning using an approved mechanical root pruning saw shall be performed prior to digging where noted on the plans, or directed by the Commissioner. Whenever roots of plant material to remain are exposed during construction, the damaged root ends are to be removed by cutting them off cleanly.

Initial watering shall be performed on all trees, which are designated for root pruning. Water trees immediately by thoroughly saturating root balls and provide a horticultural watering bag, such as a Gator Bag or equivalent, filled with water to keep root balls thoroughly saturated during first three weeks following root pruning. Thereafter refill bags as required, according to weather conditions, to keep root balls in a moist condition during growing seasons, through the duration of the Project. Test root balls for optimal moisture once a week using a soil auger.

Contractor shall be responsible for location of all utilities prior to installation of trees. Notification of Chicago's Utilities Alert Network (DIGGER) is required for all planting sites (312) 744-7000.

All pruning shall be overseen by a professional arborist (someone whose principal occupation is the care and maintenance of trees). All pruning shall be done according to the National Arborist Association's Pruning Standards for Shade Trees Class 11 - Standard Pruning Specifications.

Any damage to the root zone, as determined by the Commissioner, will be compensated by pruning an equivalent amount of the top vegetative growth of the material within 1 week following root damage, fertilization and supplemental watering.

Fertilize damaged trees with fertilizer that promotes root growth. Fertilizer nutrients shall be applied within 48 hours after root damage occurs. Fertilizer nutrients shall be applied within 48 hours after root damage occurs. A fertilizer with a 1: 1: 1 ratio shall be applied at the rate of .5 pounds of nutrients per 1000 square feet (2 kg per 90 square meters).

Application shall be accomplished by placing dry fertilizer in holes in the soil. The holes shall be 8 inches to 12 inches deep and spaced 24 inches apart in an area beginning 30 inches from the base of the plant. Holes can be punched with a punch bar, dug with a spade, drilled with an auger or any other method approved by the Commissioner. Approximately 0.02 pounds of fertilizer nutrients shall be placed in each hole 250 holes per 1000 square feet. Fertilizer Nutrients shall not be measured for payment but considered incidental to root pruning. If the Commissioner determines that the whole method of fertilizer placement is not practical or desirable, an approved method of uniform surface application will be allowed. Neither separate measurement nor payment will be made for fertilization, but will be considered incidental to the cost of TREE PROTECTION.

Supplemental water shall be applied within 48 hours of any root damage. The water shall be applied at the rate of 7 quarts per square yard of surface area within the root zone of plant material having sustained damage to the root zone. Root zone shall be calculated as the areas, which extend three meters beyond the limits of the crown's branches. Subsequent weekly watering shall be applied if deemed necessary by the Commissioner. Neither separate measurement nor payment will be made for supplemental watering but will be considered incidental to the cost of TREE PROTECTION.

The Contractor shall repair or replace any and all damage determined by the Commissioner to any existing or newly installed plant material at its own expense. Unnecessary damage to ground cover or turf shall be repaired or replaced as specified for restoration of similar areas within the plans, or as directed by the Commissioner, and shall be at the Contractor's expense.

Materials shall be disposed of according to Article 202.03.

Method of Measurement: TREE PROTECTION will be measured as each for individual trees protected.

Basis of Payment: This work will be paid for at the contract unit price for each TREE PROTECTION.

ITEM 5 - CDOT2010030 – TREE REMOVAL (1 TO 6 UNITS DIAMETER)

Effective: January 15, 2010
Revised: March 21, 2022

Description: Work under this item shall consist of cutting, removing, and disposing of all trees, saplings, clusters of individual trees and stumps at the locations shown on the plans or as directed by the Commissioner. Work under this item shall be performed according to Section 201 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

Method of Measurement: Removal of trees, saplings, clusters of individual tress and stumps measuring less than 1 inch unit diameter will not be measured for payment.

Basis of Payment: This work will be paid at the contract unit price per unit diameter for TREE REMOVAL (1 TO 6 UNITS DIAMETER).

ITEM 13 - CDOT2070020 - POROUS GRANULAR EMBANKMENT, SUBGRADE

Effective: October 1, 2010

Description: Work under this item shall be performed according to Section 207 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

This work shall consist of furnishing, placing, and compacting porous granular material to the lines and grades shown on the plans, where unsuitable subgrade conditions are encountered or as directed by the Commissioner.

Material: The material shall be according to Article 1004.05 for Porous Granular Embankment except as modified herein.

Article 1004.05 (a) shall be replaced with the following.

> **Description:** The coarse aggregate shall be gravel, crushed gravel, crushed stone, crushed blast furnace slag, or crushed concrete. All material shall be current under IDOT AGCS Program.

Article 1004.05 (c) shall be replaced with the following.

> **Gradation:** The coarse aggregate shall meet the CA/CM01 gradation for cuts greater than 6 inches. When cuts are 6 inches or less the coarse aggregate shall meet the CA/CM05 or CA/CM07 gradation.

Construction Requirements: The porous granular material shall be placed in one lift when the total thickness to be placed is 2 feet or less or as directed by the Commissioner. Each lift of the porous granular material shall be rolled with a vibratory roller meeting the requirements of Article 1101.01 of the Standard Specifications to obtain the desired keying or interlock and compaction. The Commissioner shall verify that adequate keying has been obtained.

A 3 inch nominal thickness top lift of capping aggregate having a gradation of CA 6 will be required when granular sub-base is not specified in the contract plans and Porous Granular Embankment, Subgrade will be used under the pavement. Capping aggregate will not be required when granular sub-base is placed on top of the porous granular material.

Construction equipment not necessary for the completion of the replacement material will not be allowed on the undercut areas until the recommended thickness of the porous granular embankment subgrade is completed.

Full depth subgrade undercut should occur at limits determined by the Commissioner. A transition slope to the full depth of undercut shall be made outside of the undercut limits at a taper of 1 foot longitudinal per 1 inch depth below the proposed subgrade or bottom of the proposed granular sub-base when included in the contract.

Method of Measurement: This work will be measured for payment in place in cubic yards. When specified on the contract plans, the theoretical elevation of the bottom of the granular sub-base shall be used to determine the upper limit of Porous Granular Embankment, Subgrade. The volume

will be computed by the method of average end areas.

Basis of Payment: This work will be paid for at the contract unit price per cubic yard for POROUS GRANULAR EMBANKMENT, SUBGRADE. This item shall be used per the plans or as field conditions warrant at the time of construction. No adjustment in unit price will be allowed for an increase or decrease in quantities from the estimated quantities shown on the plans.

ITEM 15 - CDOT2110010 - PULVERIZED TOPSOIL MIX

Effective: July 15, 2009

Description: Work under this item shall be performed according to Section 211 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified:

General: Topsoil furnished from outside the limits of the right-of-way shall be pulverized or screened, natural, fertile, friable soil possessing characteristics of rich productive soils in the Chicago area. It shall be obtained from naturally well-drained areas, not excessively acid or alkaline and contain no toxic substances which may be harmful to plant growth. It shall be completely without admixture of subsoil, free from clay lumps, roots, stones, and other debris. The topsoil shall not be handled in frozen or muddy conditions.

The Contractor shall inform the Commissioner in writing, ten (10) days in advance of the delivery of topsoil to the job site, as to the location from which the topsoil is to be obtained, the crops or plants which have been grown in the soil during the past five (5) years and the depth to which the top soil is to be taken. A minimum of three (3) samples of the topsoil proposed for this work shall be furnished a minimum of ten (10) days before delivery of topsoil to the job site. Each sample submitted shall be in a separate container, approximately one quart in size, appropriately labeled and taken from a different location at the source. Each container shall be completely filled with uncompacted topsoil.

A sample, free from extraneous materials, shall comply with the following requirements in addition to the requirements set forth in Section 211 of the IDOT Standard Specifications for Road and Bridge Construction:

1. It shall contain not less than twelve percent (12%) or more than forty percent (40%) clay as determined in accordance with AASHTO T 88.

2. It shall contain not less than twenty-five percent (25%) or more than fifty-five percent (55%) sand as determined in accordance with AASHTO T 88.

Method of Measurement: PULVERIZED TOPSOIL MIX will be measured in place and the area computed in cubic yards.

Basis of Payment: This work will be paid at the contract unit price per cubic yard for PULVERIZED TOPSOIL MIX which price shall be payment for completing the work as specified.

ITEM 16 - ****** - CDOT STRUCTURAL SOIL**

Effective: February 1, 2009
Revised: August 17, 2011

Description: Work under this item shall consist of furnishing and placing CDOT STRUCTURAL SOIL to meet elevations as specified on the plans and be performed in accordance with Granular Subbase, Type B, Section 311 of the Standard Specification for Road and Bridge Construction, except as herein modified. Structural soil is designed to function as a sub-base material under sidewalk as well as a growing media outside of the tree planting areas.

Material: A uniformly blended mixture of coarse aggregate, soil and a type of hydrogel consisting of potassium propenoate-propenamide copolymer crystals ("PPPC") mixed to the following proportion:

Component	Composition
Angular non-limestone Aggregate	80-84% of total wet weight
Soil	16-20% of total wet weight
PPPC	12 oz./ cubic yard
Total moisture	8.5% – 11.0% of total weight (Determined by AASHTO T 265)

Materials shall be according to the following notes:

(a) The non-limestone aggregate shall be a uniformly graded ¾"- 1½" angular crushed stone with no more than 10% passing the ½" sieve as determined by AASHTO T 27.

(b) The soil shall be a "clay loam" based on the "USDA classification system" and also meet the mechanical analysis requirements detailed below as determined by a mechanical analysis using method ASTM D 422. The soil shall be of uniform composition, without admixture of subsoil. The soil shall be the product of a commercial processing facility specializing in production of stripped natural topsoil.

Mechanical analysis:

Soil Components	% of total weight
Gravel	< 5%
Sand	25 - 45%
Silt	15 - 60%
Clay	20- 40%

Chemical analysis: Meet or be amended to meet the following criteria.

pH	6.5 - 7.5 (ASTM D 4972)
Organic Content	2 - 5% (AASHTO T 194)

(c) The type of hydrogel shall be a non-toxic, non-phytotoxic tackifier consisting of PPPC.

Equipment: The soil components shall be spread in layers (Aggregate, PPPC, Clay Loam) on a clean, paved surface at the supplier's facility. The components shall be folded and mixed with front end loaders until uniformly blended.

General Requirements: STRUCTURAL SOIL shall be stored in stockpiles at the producer's or supplier's facility and be protected from erosion, absorption of excess water, and contamination at all times. Delivery to the job site shall only occur after the Commissioner has reviewed and preliminarily approved the testing results obtained by the supplier's certified laboratory as detailed in the Quality Control (QC) Requirement section. Final acceptance will be determined by the Commissioner after delivery to the site has been completed and after all Quality Assurance (QA)testing has been completed, if deemed necessary by the Commissioner.

A mechanical and chemical analysis shall be performed on the soil mix sample and the results shall fall within the above-referenced limits. The coarse aggregate must also be tested for gradation and shall meet the requirements as detailed above. The mechanical analysis may be completed prior to performing the chemical analysis. If the results of the mechanical analysis are within the specified limits, then a chemical analysis shall be performed on the soil mix sample to determine if the results fall within the specified limits.

Submittals: Upon the completion of all mechanical and chemical analyses, a final report prepared by the certified testing laboratory (according to the QC Requirements section) detailing these results shall be submitted to the Commissioner for review. The final report shall include the project number, project name, source of material, and quantity of material represented by the samples. A sealed, 1 quart container sample shall be submitted to the Commissioner for approval.

Construction Requirements: Locate and confirm the location of all underground utility lines and structures prior to the start of any excavation. Complete all walls, curb footings, and utility work in the work area prior to installing the STRUCTURAL SOIL.

Excavate and compact the proposed subgrade to depths, slopes and widths as shown on the contract plans. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope parallel to the finished grade and or toward the subsurface drain lines as shown on the drawings. Verify that subgrade is adequately graded and compacted prior to placement. Notify the Commissioner of any subsurface conditions which will affect the Contractor's ability to complete the work.

Clear the excavation of all construction debris, trash, rubble and any foreign material. In the event that fuels, oils, concrete washout, silts or other material harmful to plants have been spilled into the subgrade material, excavate the soil sufficiently to remove the harmful material. Fill any over excavation with approved fill and compact to the satisfaction of the engineer. The cost of this work is incidental to this item.

Do not deliver or place soils in frozen, wet, or muddy conditions. Do not deliver or place materials in an excessively moist condition. Stockpiling of material on site will be limited to an amount of material that can be used within a reasonable time period and must be approved by the Commissioner.

Protect soils and mixes from absorbing excess water and from erosion at all times. Do not store materials unprotected from large rainfall events. Do not allow excess water to enter site prior to

compaction. If water is introduced into the material after grading, allow material to drain or aerate to within the required moisture content range. Do not install in rainy conditions.

Protect adjacent walls, walks and utilities from damage or staining by the soil. Use 1/2" plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work. Any damage to adjacent facilities incurred during the installation of structural soil shall be repaired incidental to this item.

Install and compact CDOT STRUCTURAL SOIL in six inch lifts and bring to finished grades as shown on the contract plans. Immediately protect the STRUCTURAL SOIL from contamination by toxic materials, trash, debris, water containing cement, clay, silt or materials that will alter the particle size distribution of the mix with plastic or plywood as directed by the Commissioner.

Clean up work area at the end of each working day. Do not track soil from the site onto adjacent property and the public right of way. Upon completion of the of this work, remove all excess fills, soils and mix stockpiles and legally dispose of all waste materials, trash and debris. Remove all tools and equipment and provide a clean, clear site. Sweep, do not wash surfaces of dirt and mud until sidewalk has been installed over the STRUCTURAL SOIL.

Quality Control Requirements: At least 14 days prior to installation, the Contractor shall submit to the Commissioner a copy of the supplier's material test reports for the specific batch of material to be delivered. No materials shall be ordered until the required submittals have been reviewed and approved by the Commissioner. Approval shall not constitute final acceptance. The Commissioner reserves the right to reject, on or after delivery, any material that does not meet these specifications.

All testing shall be completed by laboratories that are either AASHTO certified or certified under the Illinois Soil Testing Association's Laboratory Proficiency Testing Program to perform the testing as detailed above. Mechanical testing and chemical testing may be completed by different laboratories as long as each laboratory is certified to perform the tests for which they have provided results.

Method of Measurement: CDOT STRUCTURAL SOIL will be measured in place and the volume computed in cubic yards.

Basis of Payment: Structural Soil will be paid for at the contract unit price per cubic yard for CDOT STRUCTURAL SOIL.

ITEM 32 - ****** – BUS PAD PCC PAVEMENT, 12" (HES)**

Description: Work performed under this item shall be in accordance with Section 420 of the IDOT Standard Specifications for Road and Bridge Construction, and with the City of Chicago's Special Provisions for Jointing P.C. Concrete Pavement and P.C. Concrete Base, that are included herein. These items consist of constructing a bus pad pavement composed of Portland cement concrete with reinforcement, constructed on a prepared subbase as shown on the plans.

General Requirements: Do not place concrete on soft, muddy, or frozen subgrade or subbase. Grade, compact, trim and finish the subgrade or subbase according to Section 301 IDOT Standard Specifications for Road and Bridge Construction. The minimum width of the prepared subgrade or subbase must be according to the cross sections as shown on the plans.

Construct joints of type and dimensions, and at the locations required on the plans. Construct joints in accordance with Article 420.05 in the Standard Specifications. Any dowel bars and reinforcement bars used in the pavement for jointing will be considered included in the cost of this item. Seal joints before the pavement is opened to traffic, including construction traffic, and as soon after the curing period as possible.

Materials are to meet the requirements of Sections 1020, 1006, 1050, and 1051 of the IDOT Standard Specifications for Road and Bridge Construction.

The sequence of finish operations is as follows: strike off, consolidation, screed, longitudinal floating, straightedge, edging, and final finish. Pavement shall be tined in accordance with Article 420.09 (e) (1). The primary purpose of the consolidation and finishing operations is to produce a satisfactory surface. If this provision is not being complied with, or modifications need to be made to the operations to assure a satisfactory surface, the paving operations will be stopped by the Engineer and the Contractor will not be permitted to proceed until satisfactory results are assured.

The Contractor must protect the pavement and its appurtenances against both public traffic and traffic caused by the Contractor's own employees and agents. The Contractor will be required to repair any damage to the pavement occurring prior to final acceptance or be required to replace the pavement, in a manner acceptable to the Engineer. No additional payment will be allowed for repair or replacement of pavement damaged in this manner.

Included in the cost of this item is compliance with IDOT Recurring Special Provision check sheet # 31: Quality Control / Quality Assurance of Concrete Mixtures.

HIGH-EARLY-STRENGTH PORTLAND CEMENT CONCRETE must achieve a minimum flexural strength of 3500 psi within 3 days of placement.

Apply a protective coat of Penetrating Silane Sealer: Water-Repellant, penetrating alkyl alkoxy silane sealer to all exposed concrete surfaces. Sealer will be incidental to the cost of any concrete pay item and must follow the following characteristics:

1. Not less than 40% solids content by weight.
2. Clear, colorless, does not affect color of substrate.

The following products are available for use:

A. Silvento Inc. "Chem-Trete BSM 40"

B. L & M Construction Chemicals “Pentane/40”
C. Sonneborn “Sonosheild Penetrating Sealer 40
D. Hydrozo, Enviroseal 40 Clear Water Repellent Sealer

Application of the sealer must comply with the manufacturer’s recommendations. THE USE OF LINSEED OIL WILL NOT BE PERMITTED.

Method of Measurement: BUS PAD PCC PAVEMENT, 12" (HES) will be measured for payment in place and the area computed in square yards. The length will be measured along the centerline of the surface of each roadway. The width will be the width of pavement as shown on the plans.

Basis of Payment: This work will be paid for at the contract unit price per square yard for BUS PAD PCC PAVEMENT, 12" (HES) which price includes payment for all labor, material, and equipment necessary to complete the work described above, including any dowel bars and reinforcement bars used in the pavement for jointing and protective coat.

ITEM 34 - CDOT4230010 - HIGH-EARLY-STRENGTH PORTLAND CEMENT CONCRETE DRIVEWAY PAVEMENT 8 INCH

Effective: July 1, 2009
Revised: September 16, 2022

Description: Work under this item shall be performed according to Section 423 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

Materials: The Cement Factor shall be a minimum of 6.55 cwt and a maximum of 7.05 cwt. The mix shall be designed according to Section 3.0 of the IDOT QC/QA PCC Level III Technician Manual. High early strength concrete shall achieve a minimum compressive strength of 3,500 psi within 3 days of placement.

Method of Measurement: This work will be measured for payment in place and the area computed in square yards.

Basis of Payment: This work will be paid for at the contract unit price per square yard for HIGH-EARLY-STRENGTH PORTLAND CEMENT CONCRETE DRIVEWAY PAVEMENT 8 INCH

ITEM 35 - CDOT4230030 – HIGH-EARLY-STRENGTH PORTLAND CEMENT CONCRETE ALLEY PAVEMENT 8 INCH

Effective: July 1, 2009
Revised: September 16, 2022

Description: Work under this item shall be performed according to Section 423 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

Materials: The Cement Factor shall be a minimum of 6.55 cwt and a maximum of 7.05 cwt. The mix shall be designed according to Section 3.0 of the IDOT QC/QA PCC Level III Technician Manual. High early strength concrete shall achieve a minimum compressive strength of 3,500 psi within 3 days of placement.

Basis of Payment: This work will be paid for at the contract unit price per square yard for HIGH-EARLY-STRENGTH PORTLAND CEMENT CONCRETE ALLEY PAVEMENT 8 INCH.

ITEM 36 - CDOT4240010 - PORTLAND CEMENT CONCRETE SIDEWALK 5 INCH
ITEM 37 - ****** - PORTLAND CEMENT CONCRETE SIDEWALK 8 INCH**

Effective: December 1, 2008
Revised: July 1, 2010

Description: Work under this item shall be performed according to Section 424 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

Construction Requirements: This work shall be constructed according to current City of Chicago Department of Transportation ADA Standards. Construction of ADA ramps will be paid for separately.

Method of Measurement: This work will be measured for payment in place and the area computed in square feet.

Basis of Payment: This work will be paid for at the contract unit price per square foot for PORTLAND CEMENT CONCRETE SIDEWALK 5 INCH.

ITEM 38 - CDOT4240040 - PORTLAND CEMENT CONCRETE ADA RAMP 8 INCH

Effective: December 1, 2008
Revised: July 1, 2010

Description: Work under this item shall be performed according to Section 424 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

Construction Requirements: This work shall be constructed according to current City of Chicago Department of Transportation ADA standards.

Method of Measurement: This work will be measured for payment in place in square feet. It will include the side curbs, side flares, level landing area, ramps and the sidewalk constructed between adjacent ramps within the corner radius.

Basis of Payment: This work will be paid for at the contract unit price per square foot for PORTLAND CEMENT CONCRETE ADA RAMP 5 INCH and PORTLAND CEMENT CONCRETE ADA RAMP 8 INCH. Detectable warning tiles required for this work will be paid for separately.

ITEM 39 - CDOT4240055 - LINEAR DETECTABLE WARNING TILES (CAST IRON)
ITEM 40 - CDOT4240065 - RADIAL DETECTABLE WARNING TILES (CAST IRON)

Effective: May 21, 2012

Description: Work under this item shall consist of installing cast iron detectable warning tiles on ADA curb ramps as shown on the plans and according to the latest Chicago Department of Transportation ADA Standards. Work shall be performed according to Section 424 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

Material: Detectable warning tiles shall be cast gray iron and shall be provided by a Manufacturer approved by the City of Chicago Department of Transportation. A list of approved Manufacturers of cast iron detectable warning tiles is available on the City of Chicago Department of Transportation website under Construction Guidelines/Standards.
The cast iron detectable warning tiles shall be of uniform quality, free from surface defects and shall be provided with an untreated, natural surface finish as directed by the Commissioner.

Construction Requirements: The detectable warning system shall be installed in fresh concrete and shall comply with the City of Chicago Department of Transportation Regulations for Openings, Construction and Repair in the Public Way, Appendix B, ADA Standards. The equipment and installation procedures shall be according to the Manufacturer's specifications.
The contractor shall install the detectable warning system flush with adjacent concrete, and resulting in a snug fit between tiles to limit water infiltration around the perimeter of the system and between tiles, as directed by the Commissioner.

QC/QA Requirements: A Manufacturer's written certification that the material complies with these specifications shall be provided to the Commissioner.

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

Basis of Payment: This work will be paid for at the contract unit price per square foot for LINEAR DETECTABLE WARNING TILES (CAST IRON) and RADIAL DETECTABLE WARNING TILES (CAST IRON).

ITEM 41 - CDOT4240070 - PROPERTY LINE CURB

Effective: July 1, 2010

Description: Work under this item shall be performed according to Section 424 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

General Requirements: This work shall be provided to maintain proper elevation for constructing ADA ramps as shown in the plans and as directed by the Commissioner.

Construction Requirements: This work shall be constructed according to current City of Chicago Department of Transportation ADA Standards.

Method of Measurement: This work will be measured for payment in feet along the face of the curb.

Basis of Payment: This work will be paid for at the contract unit price per foot for PROPERTY LINE CURB.

ITEM 43 - CDOT4400010 - HOT-MIX ASPHALT SURFACE REMOVAL, VARIABLE DEPTH

Effective: May 15, 2009
Revised: July 1, 2010

Description: Work under this item shall be performed according to Section 440 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

This work shall consist of the removal of hot-mix asphalt (HMA) surfaces, including adjacent Portland cement concrete pavement, trenches, and patches, in preparation for subsequent resurfacing as shown in the plans and as directed by the Commissioner.

Construction Requirements: Prior to the start of grinding operations, all open lid structures shall be protected to prevent any grinding debris from entering the structure. Any debris entering structures shall be immediately removed and the entire structure shall be cleaned at no cost to the City.

Method of Measurement: This work will be measured for payment in square yards. No adjustment will be made for variations in the depth of material removed.

Basis of Payment: This work will be paid for at the contract unit price per square yard for HOT-MIX ASPHALT SURFACE REMOVAL, VARIABLE DEPTH.

ITEM 44 – X4400100- PORTLAND CEMENT CONCRETE SURFACE REMOVAL, VARIABLE DEPTH

Description: Work under this item shall be performed according to Section 440 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

This work shall consist of the removal of Portland cement concrete pavement, trenches, and patches, in preparation for subsequent resurfacing as shown in the plans and as directed by the Commissioner.

Construction Requirements: Prior to the start of grinding operations, all open lid structures shall be protected to prevent any grinding debris from entering the structure. Any debris entering structures shall be immediately removed and the entire structure shall be cleaned at no cost to the City.

Method of Measurement: This work will be measured for payment in square yards. No adjustment will be made for variations in the depth of material removed.

Basis of Payment: This work will be paid for at the contract unit price per square yard for CONCRETE SURFACE REMOVAL, VARIABLE DEPTH.

ITEM 45 - ****** - DRIVEWAY AND ALLEY PAVEMENT REMOVAL**

Description: Work under this item shall be performed according to Section 440 of the Standard Specifications, except as herein modified.

Work under this item shall consist of the removal and disposal of existing driveway and/or alley pavement section, and any other material encountered, from the existing elevation to the proposed subgrade elevation.

Construction Requirements: Prior to the start of removal operations, all open lid structures shall be protected to prevent any debris from entering the structure. Any debris entering structures shall be immediately removed and the entire structure shall be cleaned at no cost to the City.

Method of Measurement: This work will be measured for payment in place and the area computed in square yards.

Basis of Payment: This work will be paid for at the contract unit price per square yard for DRIVEWAY AND ALLEY PAVEMENT REMOVAL.

ITEM 48 - ****** - SIDEWALK REMOVAL**

Description: Work under this item shall be performed according to Section 440 of the Standard Specifications, except as herein modified.

Work under this item shall consist of the removal and disposal of the existing sidewalk, and any other material encountered, from the existing elevation to the proposed subgrade elevation.

Method of Measurement: This work will be measured for payment in place and the area computed in square feet.

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

ITEM 55 - ****** - STORM SEWERS, TYPE 2, 8-INCH (EXTRA STRENGTH VITRIFIED CLAY PIPE)**
ITEM 56 - ****** - STORM SEWERS, TYPE 2, 8-INCH (DUCTILE IRON PIPE)**

Description: Work under these items shall be performed according to Section 550 of the Standard Specifications and the current City of Chicago Department of Water Management (DWM) Regulations for Sewer Construction and Stormwater Management and DWM Standard Specifications for Water and Sewer Main Construction, except as herein modified. This item consists of constructing sewers to carry storm, sanitary, or a combination of sanitary and storm flows, as shown on the plans or at locations designated by the Commissioner.

This work shall consist of constructing storm sewers at locations designated by the Commissioner, including any excavation and disposal, bedding, dewatering, sheeting and/or shoring required to perform the work as specified.

Material: Materials shall be per the most current DWM Standard Specifications for Water and Sewer Main Construction.

Construction Requirements: Where a storm sewer or drain connection is to be made to a proposed E.S.V.C.P. sewer a manufactured Y or T branch pipe shall be installed in the sewer at this junction.

Where a storm sewer or drain connection is to be made to a proposed R.C.P. sewer a pipe section with a predrilled hole of the proper diameter shall be installed at this junction.

Where a storm sewer or drain connection is made to an existing sewer, a “T” or “Y” saddle shall be installed. The circular opening in the existing storm sewer must be core drilled to the same size as the external diameter of the proposed sewer or drain connection. The protrusion of the proposed sewer into the existing sewer must not exceed a maximum of 1 inch. Edge of core holes must be a minimum of 1.5 feet from the edge of pipe and a minimum distance of 5 feet horizontally between holes. Do not drill holes higher than 10 and 2 o’clock.

All ductile iron pipe must be encased in 4-mil, cross-laminated, high density polyethylene tubing meeting the requirements of AWWA C105.

Where less than three feet of cover exists, use ductile iron pipe.

QC/QA Requirements: The Contractor must provide a Manufacturer’s written certification that the materials comply with these specifications.

Inspection and Acceptance: All sewers and sewer structures must be inspected by the Department of Sewers prior to the final payment to the Contractor. In conjunction with these sewer inspections, the Contractor must furnish a videotape of a televised inspection of the interior of all main line sewer constructed and the existing main line sewer connected to under this contract. Record the videotape under the supervision of the Commissioner. The cost of producing and furnishing the video tape will be incidental to the STORM SEWER items(s) of the contract. Perform 2 sessions of videotaping of the sewer: 1) before construction and 2) prior to the placement of final wearing surface. The name, phone number, and contact person of the firm which will be performing the videotaping of the sewer must be provided by the Contractor at the preconstruction meeting.

Clean all sewers prior to videotaping. The final acceptance of the sewer shall be based on the sewer videotape. All deficiencies exposed on the videotape must be corrected by the Contractor within 30 calendar days of notification.

All costs incurred by the Contractor to make the required repairs are to be borne solely by the Contractor. Pavement removal, if required, must be in full panel sections and pavement anchors will be required for pavement restoration. The Contractor is required to re-videotape the sewer to verify that the deficiencies noted on any previous videotape have been corrected to the satisfaction of the Chicago Department of Sewers. All costs to re-videotape the sewer, regardless of the number of times required, will be borne solely by the Contractor. Every effort is to be made by the Contractor to correct all deficiencies prior to the placement of the final wearing surface. If, in the opinion of the Commissioner, the Contractor has delayed in submitting the videotape, the placement of the final wearing surface may be suspended. No time extension will be granted due to this suspension and the Commissioner will be sole judge as to any delays. Include location maps, legends and descriptions on all videotape submittals. 2 copies of each submittal are required.

Method of Measurement: This work will be measured for payment in place per foot. When a proposed sewer is to be placed at the same location of an existing sewer, the removal of the existing sewer will not be measured for payment. Televising and inspection of sewers will not be measured separately for payment and is considered incidental to the work.

Basis of Payment: This work will be paid for at the contract unit price per foot for STORM SEWERS, TYPE 2, 8-INCH (EXTRA STRENGTH VITRIFIED CLAY PIPE), STORM SEWERS and TYPE 2, 8-INCH (DUCTILE IRON PIPE). Excavation in rock will be measured and paid for according to Section 502.

ITEM 57 - ****** - PLUG EXISTING SEWER**

Description: This work shall consist of plugging and filling existing sewers as shown on the plans and as directed by the Commissioner. This work shall be completed in accordance with applicable portions of Sections 593 and 605 of the Standard Specifications, except as modified herein.

Sewer plugs shall be 2" long (minimum) concrete or grout plug. The plug shall prevent ground water from entering the existing sewer and through drainage.

Material for filling abandoned sewers shall be Controlled Low-Strength Material (CLSM) in conformance with the applicable portions of Section 593 of the Standard Specifications.

Method of Measurement: This work will be measured for at the contract unit price per each.

Basis of Payment: This work will be paid for at the contract unit price per each for PLUG EXISTING SEWER, which prices shall include all labor, equipment and materials necessary to complete the work as shown on the plans.

ITEM 58 - CDOT6020010 - CATCH BASINS, TYPE A, 4'-DIAMETER, TYPE 1 FRAME, OPEN LID (CITY OF CHICAGO)
ITEM 59 - CDOT6020020 - INLETS, TYPE A, TYPE 1 FRAME, OPEN LID (CITY OF CHICAGO)

Effective: July 15, 2009

Description: Work under this item shall be performed according to Section 602 of the IDOT Standard Specifications for Road and Bridge Construction and the City of Chicago Department of Water Management Standard Specifications for Water and Sewer Main Construction, except as herein modified.

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

Basis of Payment: This work will be paid at the contract unit per each for CATCH BASINS, TYPE A, 4 '-DIAMETER, TYPE 1 FRAME, OPEN LID (CITY OF CHICAGO) and INLETS, TYPE A, TYPE 1 FRAME, OPEN LID (CITY OF CHICAGO).

ITEM 60 - ****** - REMOVING MANHOLES**
ITEM 61 - CDOT6050020 - REMOVING CATCH BASINS
ITEM 62 - CDOT6050030 - REMOVING INLETS

Effective: May 15, 2009
Revised: August 8, 2016

Description: Work under this item shall be performed according to Section 605 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

General Requirements: The void formed by the removal of the structure shall be backfilled with coarse aggregate and compacted as specified in the City of Chicago Department of Water Management Standard Specifications for Water and Sewer Main Construction.

The Contractor shall deliver all old frames to the City at a facility designated by the Commissioner. A signed and dated receipt for the delivery of the old frames shall be given to the Commissioner.

Method of Measurement: This work will be measured for payment per each. All work associated with the salvage of the frames and lids shall be incidental to this item.

Basis of Payment: This work will be paid at the contract unit per each for REMOVING MANHOLES, REMOVING CATCH BASINS, and REMOVING INLETS.

ITEM 63 - ****** - FRAMES AND LIDS (CITY OF CHICAGO)**

Description: Work under this item shall be performed according to Section 604 of the IDOT Standard Specifications for Road and Bridge Construction and the current City of Chicago Department of Water Management Standard Specifications for Water and Sewer Main Construction, except as herein modified.

General Requirements: An ADA compliant frame and lid shall be placed on any structure located within the cross walk or as directed by the Engineer.

At the direction of the Engineer, existing frames and lids shall be removed and delivered to the City. A signed and dated receipt for the delivery of the frames and lids shall be submitted to the Commissioner.

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

Basis of Payment: This work will be paid for at the contract unit price per each for FRAMES AND LIDS (CITY OF CHICAGO).

ITEM 64 - ****** - ADDITIONAL MASONRY**

Description: Work under this item shall be performed according to Section 602 of the Standard Specifications except as herein modified.

This work shall consist of providing the additional masonry work, in excess of 2 feet, which is required to rebuild to good condition or adjust existing catch basins, manholes, inlets, vaults or hand holes to the proposed grade.

Material: Materials shall be according to the following:

Item	Article/Section
(a) Building Brick (Made from Clay or Shale)	1041.01

General Requirement: Requirements of this item are the same as those of catch basin, manhole, inlet, vaults, or City electric manhole or handhole adjustments.

Method of Measurement: The cost of the first 2 feet of masonry required will be included in the contract unit price for DRAINAGE & UTILITY STRUCTURES TO BE ADJUSTED. This work for additional masonry will be measured for payment in place per vertical foot.

Basis of Payment: This work will be paid for at the contract unit price per vertical foot for ADDITIONAL MASONRY, which includes all labor, material, equipment and disposal costs to complete the work as specified.

ITEM 65 - ****** - TELEVISE EXISTING STORM SEWER, 12 INCH**
ITEM 66 - ****** - TELEVISE EXISTING STORM SEWER, 15 INCH**
ITEM 67 - ****** - TELEVISE EXISTING STORM SEWER, 24 INCH**
ITEM 68 - ****** - TELEVISE EXISTING STORM SEWER, 30 INCH**
ITEM 69 - ****** - TELEVISE EXISTING STORM SEWER, 36 INCH**
ITEM 70 - ****** - TELEVISE EXISTING STORM SEWER, 48 INCH**
ITEM 71 - ****** - TELEVISE EXISTING STORM SEWER, 54 INCH**
ITEM 72 - ****** - TELEVISE EXISTING STORM SEWER, 72 INCH**
ITEM 73 - ****** - TELEVISE EXISTING STORM SEWER, 78 INCH**

Description: This work includes televised inspections and documentation of existing sewer conditions.

General Requirements: All sewer(s) must be videotaped within one (1) month of the start of construction, unless directed otherwise by the Commissioner. Any out of focus or distorted audio on any portion of the videotape will be cause for rejection of the videotape and require re-taping the inspection of the sewer at the Contractor's expense. No additional working days will be allowed due to delays in securing the videotaping services of a private vendor.

Construction Requirements:

Televising Procedures

A. Televised sewer inspections must be restricted to one (1) section of the sewer at a time, starting and stopping at manholes, junction structures, or other point of access to provide a high quality video inspection. The televising procedure must be performed so as to avoid creating backups in sewage flow sufficient enough to cause disruptions in service or flooding. When a high volume of sewage flow is present within the sewer and prevents a televised inspection, the Contractor must notify the Commissioner on how to proceed with the work. The Contractor is to flush sewers when necessary to remove light accumulations of debris to facilitate the televised inspection.

B. The video camera must be passed through the sewer at a uniform rate of travel not to exceed 30-feet per minute. The inspection must show the top and sides of sewer pipes, manholes, junctions, house connections, obstructions, or other conditions, which reveal the sewers architecture and physical condition. Panning and zoom rates must be controlled to provide clarity of the videotaped inspection during playback.

C. If the video camera is inhibited by any obstruction, which was not removed by flushing, the Contractor must re-set the equipment in a manner so that the inspection can continue from the opposite direction. If the obstruction prevents further videotaping of the sewer, the Contractor must notify the Commissioner on how to proceed with the work.

D. The contractor is responsible for locating all live drains, dead drains and lateral sewers connected to the main sewer section being videotaped.

E. All sewer and lateral connections, manhole risers, missing bricks, voids and dark areas are to be videotaped. The camera must be held in the viewing position long enough for a proper evaluation to be performed.

F. If necessary, a high pressure water jet spray will be utilized downstream of the camera. The spray must be equally spread out within the sewer to define the contour shape of the sewer.

G. If the camera should go underwater, the Contractor must upright or adjust the camera height and re-videotape the omitted portion of the sewer.

H. Measurements for location references within the sewer must be referenced to above ground locations by means of a metering device. Marking of the transport cable(s), or similar method requiring interpolation for distances or sewer depths, is not acceptable. Location references must begin at the centerline of the upstream manhole or access point, unless directed otherwise by the Commissioner. All distance measurements must be narrated and electronically shown on the videotaped inspection as appropriate.

Recorded Information for Sewer Inspections

A. Audio and written documentation must accompany all videotapes submitted to the Commissioner.

B. The voice narrations on the videotape(s) must provide brief but informative comment on data of significance, i.e., the distance traveled within the sewer, location of any unusual conditions or damage, collapsed pipe or manhole sections, blockages, or other discernible features.

C. The videotape(s) must include the following information:

1. Data View:
    a. Name of streets containing sewers being televised.
    b. Report or videotape number.
    c. Date of TV inspection.
    d. Upstream and downstream manhole or station numbers.
    e. Current distance of travel (tape counter distance).

2. Printed labels on tape container and tape cartridge must include location, date, format, and other descriptive reference information.

Submittals:
The Contractor must provide two videotaped inspections for documenting the condition of existing City sewers within the area of construction, or in areas as directed by the Commissioner. The first videotaped inspection must be made before the start of any construction. The second videotaped inspection is to be made after the installation of the sewer liner, and restoration of street and parkway areas has been completed. The location and narration of both the pre-construction and post construction videotaped inspections must be synchronized to enable a comparison to be made in the condition of the sewer(s) before and after construction.

Videotaped inspections must be recorded in a CD/DVD format, in high quality color. All disks submitted to the Commissioner must be read only format. Printed labels on diskette cases and diskette must include the contract name and number, date of inspection, and the location of the inspection.

Method of Measurement: This work will be measured at the contract unit price per foot for each size of sewer televised, documented and accepted by the Commissioner.

Basis of Payment: Work under this item will be paid at the contract unit price per foot for TELEVISE EXISTING STORM SEWER, 12 INCH, TELEVISE EXISTING STORM SEWER, 15 INCH, TELEVISE EXISTING STORM SEWER, 24 INCH, TELEVISE EXISTING STORM SEWER, 30 INCH, TELEVISE EXISTING STORM SEWER, 36 INCH, TELEVISE EXISITING STORM SEWER, 48 INCH, TELEVISE EXISTING STORM SEWER, 54 INCH, TELEVISE EXISTING STORM SEWER, 72 INCH, and TELEVISE EXISTING STORM SEWER, 78 INCH.

ITEM 75 - CDOT6060020 - COMBINATION CONCRETE CURB AND GUTTER, TYPE B-V.12

Effective: December 1, 2008
Revised: October 25, 2018 - BCS

Description. Work under this item shall be performed according to Section 606 of the IDOT Standard Specifications for Road and Bridge Construction, and to the City of Chicago Department of Transportation Regulations for Openings, Construction and Repair in the Public Way.

General:

Contractor is responsible for the correct lay-out of the proposed curb in coordination with any required fire hydrant relocation, prior to installation of the curb and gutter, and this work is incidental to COMBINATION CONCRETE CURB AND GUTTER, TYPE B-V.12.

In accordance with section 780 of the SSRBC, all curb installations adjacent to fire hydrants must be painted 'safety yellow' for 15 feet on each side of the fire hydrant except where the 15-foot dimension intersects a crosswalk, driveway or similar feature, and this work is incidental to COMBINATION CONCRETE CURB AND GUTTER, TYPE B-V.12. Paint does not require glass beads and should be painted to have neat straight edges along back of curb and vertically up the curb face.

Method of Measurement: Combination concrete curb and gutter will be measured for payment in feet in the flow line of the gutter and along the face of concrete curb, which measurement will include drainage castings incorporated in various curbs and curbs and gutters. All concrete curb and gutter transitions and depressed curb and gutter will be measured and paid for at the contract unit price per foot.

Basis of Payment: This work will be paid for at the contract unit price per foot, measured as specified, for COMBINATION CONCRETE CURB AND GUTTER, TYPE B-V.12 which price includes payment for all work, including but not limited to the costs for furnishing and installing joints, dowel bars, tie bars, curing, excavating and backfilling as required.

ITEM 76 – X6061902 – CONCRETE MEDIAN, TYPE SM (SPECIAL)
ITEM 77 – ****** – CONCRETE MEDIAN SURFACE, 8-INCH**

Work under these items shall be performed in accordance with Section 606 of the IDOT Standard Specifications for Road and Bridge Construction and the City of Chicago Department of Transportation Regulations for Openings, Construction and Repair in the Public Way except as herein modified, and with the details shown on the plans.

Description: These items consist of constructing Portland Cement Concrete medians, median surfaces, and miscellaneous items as shown plans and details and directed by the Commissioner.

Materials: Materials shall be according to the following.

Item	Article/Section
(a) Portland Cement Concrete	1020
(b) Reinforcement Bars and Fabric	1006.10
(c) Preformed Expansion Joint Fillers	1051
(d) Concrete Sealer	1026
(e) Dowel Bars	1006.11
(f) Tie Bars	1006.10
(g) Polysulfide Joint Sealant	1050.03

Construction Requirements: Concrete shall not be placed on soft, muddy, frozen, or non-compacted subgrade or subbase. Preparation of the subgrade or subbase shall not be paid for separately but considered incidental to this item unless otherwise noted on the plans.

For the medians when constructed adjacent to P.C.C. pavement or base course, transverse joints shall be in prolongation with joints in the pavement or base course and shall be of the same type except that dowel bars or tie bars will not be required. For corrugated medians, the Contractor has the option of constructing the joints with 3/4 inch thick performed expansion joint filler conforming to the full cross section of the median. When constructed adjacent to flexible pavement, transverse joints shall be contraction joints at 20 feet intervals.

Contraction and hinge joints shall be formed by sawing to a depth of 1/3 the thickness of the median and sealed according to Article 420.12. Expansion joints shall be formed by placing 3/4 inch thick performed expansion joint filler conforming to the full cross section of the median. When permitted by the Commissioner, expansion joints may be substituted for contraction or hinge joints.

Utility and drainage structures must be properly adjusted prior to pouring the concrete median. Shimming of structures with wood or stones to facilitate pouring will not be allowed.

Method of Measurement: Concrete medians and aprons will be measured for payment in place and the area computed in square feet. Concrete curb and combination curb and gutter around PCC median surfaces will be measured separately for payment. Saw cuts and preformed expansion joint filler required at the back of curb are incidental to this item and will not be paid for separately. Tie bars shall be quantified and paid for separately as DRILL AND GROUT DOWEL BARS.

Basis of Payment: The work shall be paid for at the contract unit price per square foot for CONCRETE MEDIAN, TYPE SM (SPECIAL) AND CONCRETE MEDIAN SURFACE, 8-INCH which price will be full compensation for furnishing and placing all materials, including all embedded reinforcing steel dowels, anchors, ties, sawcutting and sealing of joints and for all labor, equipment, tools, and incidentals necessary to complete this item. The concrete curb and curb and gutter around PCC median surfaces will be measured separately.

ITEM 83 - CDOT6700010 - ENGINEER'S FIELD OFFICE

Effective: August 1, 2008
Revised: April 29, 2021

Description: Work under this item shall consist of supplying engineer's field offices. Work under this item shall be performed according to Section 670 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

General Requirements: Field offices must comply with the requirements for Engineer's Field Office, except as herein modified.

Field offices shall have a ceiling height of not less than seven (7) ft. and a floor space of not less than 1,000 sq. ft.

Adequate all weather parking space shall be available to accommodate a minimum of 10 vehicles.

Solid waste disposal consisting of 4 waste basket(s) and an outside trash container of sufficient size to accommodate a weekly pick-up service shall be provided by the Contractor.

In addition, the following equipment and furniture meeting the approval of the Commissioner shall be furnished:

(a) Five desk(s) with minimum working surface 42"x30" each and five non-folding office chairs with upholstered seats and backs and with wheels.
(b) Two four-drawer legal size file cabinets.
(c) Six folding chairs and one 36"x96" folding tables.
(d) One office style frostless refrigerator with a minimum size of 8 cubic feet with a separate freezer unit.
(e) One microwave oven with a minimum capacity of 1 cubic foot.
(f) Two electric desk type tape printing calculators.
(g) Three telephone(s) with multiline capability touch tone and voice mail (for exclusive use by the Commissioner). Three phone line(s), one for voice, one for fax and one for security. One high speed broadband internet connection with unlimited access and wireless networking capabilities for multiple users (for exclusive use of the Commissioner).
(h) One desktop color laser multifunction fax-printer-scanner-copier with network connectivity, including maintenance, paper supply and toner. The machine shall have a minimum of 600 dpi resolution, and shall be capable of reproducing, sorting and stapling prints up to size 11"x17".
(i) Fire extinguisher
(j) One first aid cabinet fully equipped.
(k) One case of approximately twelve cans of aerosol marking paint, of the color chosen by the commissioner.
(l) Accessible potable water and coffee service.

Method of Measurement: This work will be measured for payment per calendar month or fraction thereof.

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, according to Article 670.07 of the IDOT Standard Specifications for Road and Bridge Construction.

ITEM 85 - ******** - VEHICLE TRAFFIC CONTROL AND PROTECTION

Description: Work under this item must be performed in accordance with Section 701 of the Standard Specifications, except as herein modified.

This work must consist of furnishing, installing, maintaining, relocating and subsequently removing all signs, signals, markings, traffic cones, barricades, chain link fence, warning lights, flaggers and other devices which are to be used for the purpose of regulating, warning or guiding traffic during the construction of this improvement.

General Requirements: Vehicle Control must be in accordance with the applicable section of the Standard Specifications, the applicable guidelines contained in the Illinois Manual on Uniform Traffic Control Devices for Streets and Highways, and any Special Details and Highway Standards contained herein and in the plans.

Within 10 days of the Notice to Proceed, the Contractor must submit a Vehicle Traffic Control Plan for approval by the Commissioner and must furnish the name of the individual in its direct employ who is to be responsible for the installation and maintenance of the traffic control for this project. If the actual installation and maintenance are to be accomplished by a subcontractor, consent must be requested of the Commissioner at the time of the preconstruction meeting in accordance with Article 108.01 of the Standard Specifications. This will not relieve the Contractor of the foregoing requirement for a responsible individual in its direct employ. The Department will provide to the Contractor the name of its representative who will be responsible for the administration of the Traffic Control Plan. The Contractor must notify the Chicago Department of Transportation, Division of Infrastructure Management, Public Way Permit Office at 312-744-4652, 5 business days before commencing construction or changing traffic flow.

Special attention is called to Articles 107.09 (Public Convenience and Safety) and 107.14 (Maintenance of Traffic) of the Standard Specifications and the following Highway Standards, Details, Supplemental Specifications and Special Provisions, and Recurring Special Provisions contained herein relating to vehicle traffic control.

Special attention must be given to advance guide signs during these operations in order to keep barricade placement consistent with lane assignment. The Contractor must cover all vehicle traffic control devices, which may be inconsistent with traffic patterns during the transfer from one construction stage to another.

The Contractor's vehicle must always move with and not against or across the flow of traffic. These vehicles must enter or leave work areas in a manner, which will not be hazardous to or interfere with normal traffic and must not park or stop except within designated work areas. Personal vehicles will not be permitted to park within the right of way except in specific areas designated by the Commissioner.

Vehicle Control and Protection details are included in the standard drawings to specify the minimum required combination of traffic control devices in construction areas. Revisions, by the Commissioner, to work or in the phasing of construction operations may require traffic control to be installed in accordance with a standard other than those included in the plans; in such cases, the standards will be made available to the Contractor at least one week in advance of the change in traffic control. Payment for traffic control required by these added standards will be in accordance with the Article 109.04 of the Standard Specifications. Revisions or modifications to increase the

traffic control protection shown in the contract must be submitted by the Contractor for approval by the Commissioner. A reduction of the traffic control shown in the contract will not be allowed.

If the Contractor requests and receives approval from the Commissioner to revise or change the staging of the project from that specified on the plans any additional traffic control required due to that request must be considered incidental to the contract and no additional payment will be made.

The Contractor must immediately furnish a certified flagger or flaggers if, in the opinion of the Commissioner, the Contractor's construction means or methods warrant. No additional compensation will be made for flaggers. If no flaggers are available the Contractor must cease operations until they become available.

All signs, signals, markings, traffic cones, barricades, chain link fence, warning lights, flaggers, and other traffic control devices must conform to the plans, specifications, special provisions and the latest edition of the "State of Illinois Manual on Uniform Traffic Control Devices." The Contractor must obtain, erect, maintain, and remove all traffic control devices in accordance with Article 107.14 of the Standard Specifications. Placement and maintenance of all traffic control devices will be as directed by the Commissioner. The Commissioner will be the sole judge as to the acceptability of placement and maintenance of the traffic control devices prescribed in the appropriate standards.

The Contractor must insure that all barricades, chain link fence, signs, lights and other devices installed by him are operational every day, including Sundays and holidays. In the event of severe weather conditions, the Contractor must furnish any additional personal required to properly maintain all traffic control devices as directed by the Commissioner.

This project must be constructed under detours as indicated on the "Construction Staging and Maintenance of Traffic" drawings in the plans. Construction work must not be started until detours are totally in place and operational. Construction signs referring to daytime lane closures during working hours must be removed or covered during non-working hours.

The Contractor must be responsible for the timely installation, maintenance, relocation and subsequent removal of all temporary signing, barricading and temporary striping necessary to accomplish these detours. The cost of this work will be considered included in the contract lump sum for VEHICLE TRAFFIC CONTROL AND PROTECTION.

At the completion of each stage of construction or whenever detour operations indicate that a relocation of a proposed or existing traffic control device is advisable as determined by the Commissioner, the Contractor must remove all traffic control devices, which were furnished, installed and maintained by him under this contract, and such devices must remain the property of the Contractor. Any traffic control devices furnished, installed and maintained by the City will be removed by City forces and will remain the property of the City. All traffic control devices must remain in place until specific authorization for relocation or removal is received from the Commissioner.

The Contractor must be aware of the requirements for coordination of all work in this project and adjoining or overlapping projects and for coordination of barricade placement necessary to provide a uniform traffic detour pattern. The Contractor will not be permitted to erect, change or remove its detour barricade system without the prior approval of the Commissioner.

The placement of barricades and warning signs for the required lane closures must be as specified

herein and must proceed in the direction of the flow of traffic. The removal of all signs and barricades must begin at the end of the construction areas and proceed toward oncoming traffic.

Beginning on the date when the Contractor begins work on this project he must assume responsibility for the normal maintenance of all existing roadways within the limits of the improvement. This normal maintenance will include all repair work deemed necessary by the Commissioner but will not include snow removal operations.

The work involved in maintaining the existing pavement as above specified will be paid for separately at the contract unit price for LEVELING BINDER (HAND METHOD) unless specified elsewhere in the Detailed Specifications or the Special Conditions. If no such item(s) of work has been provided for in the contract or otherwise specified for payment, this work will be paid for as extra work, in accordance with Article 109.04 of the Standard Specifications. Vehicle control and protection required for this work will be considered included in the lump sum price for VEHICLE TRAFFIC CONTROL AND PROTECTION.

A flashing arrow board meeting the requirements of Article 1106.02 of the Standard Specifications must be operating at all times when a lane is closed to traffic on a multi-lane highway. Arrow boards must be provided and located in ahead-on position within each lane closure taper. The cost of furnishing and maintaining arrow boards will be considered included in the contract lump sum price for VEHICLE TRAFFIC CONTROL AND PROTECTION.

Delays to the Contractor caused by complying with these requirements will be considered incidental to the item for Vehicle Control and Protection, and no additional compensation will be allowed.

TEMPORARY PAVEMENT MARKING - LETTERS, SYMBOLS, AND STRIPPING, 4 INCH TO 24 INCH

Description: Work under this item must be performed in accordance with the applicable portions of Section 703 of the Standard Specifications, Plan Detail Sheets, Traffic Control Standards, and as directed by the Commissioner, except as herein modified.

This work must consist of furnishing, installing maintaining and removing Temporary Pavement Markings for phased construction to define crossovers, lane closures, lane shifts, tapers or other changes to normal traffic flow patterns through construction zones.

General Requirements: Pavement Marking Tape must conform to the requirements of Article 1095.06. Painted Pavement Markings must conform to the requirements of Article 1095.02.

The surface to which the pavement marking is to be applied must be clean and dry.

Type 1 or Type II marking tape or paint must be used at the option of the Contractor, except that paint must not be applied to the Final Wearing surfaces, either within or outside the project limits, unless authorized by the Commissioner for late season applications where tape adhesion would be a problem. Type III marking tape must be used where specified on the plans and on the final wearing surface when the Temporary Pavement Markings will conflict with the Permanent Pavement Marking such as on tapers, crossovers and lane shifts.

Except during winter shutdown periods, the Contractor at its own expense replaces Temporary Pavement Marking showing deterioration for any reason within 30 calendar days after placement.

Temporary Pavement Markings that are in conflict with subsequently established pavement marking, or which interfere with the permanent pavement markings, must be removed immediately. All remaining Temporary Pavement Marking tape or paint must be removed within 5 working days after placement of the permanent pavement marking.

Failure to timely and/or properly install, maintain and remove Temporary Pavement Markings will be considered a TRAFFIC CONTROL DEFICIENCY and will be subject to charges as defined in this special provision.

Materials used and work performed to install and maintain temporary pavement markings shall be compensation separately under the appropriate contract line items.

Method of Measurement: VEHICLE TRAFFIC CONTROL AND PROTECTION will be measured for payment on a lump sum basis.

Basis of Payment: The work under this item will be paid for at the contract lump sum price as shown in the Schedule of Unit Prices for VEHICLE TRAFFIC CONTROL AND PROTECTION, which price will be payment in full for all labor, materials, transportation, handling and incidentals necessary to furnish, install, maintain, and remove all traffic control devices required by the appropriate standards and as approved by the Commissioner. No adjustment or additional compensation will be allowed except as specified herein. The salvage value of the materials removed will be reflected in the bid price for this item.

To ensure a prompt response to incidents involving the integrity of the work zone traffic control devices, the Contractor must provide a telephone number where a responsible individual can be contacted on a 24-hour-a-day basis. When The Commissioner is notified or determines a deficiency exists, The Contractor must dispatch sufficient resources within 2 hours of notification to make needed corrections of deficiencies that constitute an immediate safety hazard. If the Contractor fails to restore the required vehicle control and protection within the time limits specified above, the Commissioner will impose a daily monetary deduction for each 24-hour period (or portion thereof) the deficiency exists. This time period will begin with the time of notification to the Contractor and end with the Commissioner's acceptance of the corrections. For this project, the daily deduction will be __* per day. In addition, if the Contractor fails to respond, the Commissioner may correct the deficiencies and the cost thereof will be deducted from moneys due or which may become due the Contractor. This corrective action will in no way relieve the Contractor of contractual requirements or responsibilities. In addition any work performed by the Contractor within the work zone that presents a hazard to vehicular or pedestrian traffic will be subject to charges for TRAFFIC CONTROL DEFICIENCY. Debris removal, fly dumping, proper access to abutting property, timely and correct placement of short term, temporary and permanent pavement markings, along with all items of work contained within this item are also subject to this charge.

* CHARGE PER CALENDAR DAY = $2,500.00

ITEM 86 - ******** - PEDESTRIAN TRAFFIC CONTROL AND PROTECTION

Description: This work includes furnishing, installing, maintaining, relocating and subsequently removing all signs, signals, markings, traffic cones, barricades, chain link fence, warning lights, flaggers and other devices which are to be used for the purpose of regulating, warning or guiding pedestrian traffic during the construction of this improvement. Work under this item shall be performed according to Section 701 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

General Requirements: Pedestrian Traffic Control and Protection must be in accordance with the applicable section of the Standard Specifications, the applicable guidelines contained in the Illinois Manual on Uniform Traffic Control Devices for Streets and Highways, and any Special Details and Highway Standards contained herein and in the plans.

Within 10 days of the Notice to Proceed, the Contractor must submit a *Pedestrian Traffic Control Plan* as detailed herein for approval by the Commissioner and must furnish the name of the individual in its direct employ who is to be responsible for the installation and maintenance of the Pedestrian Traffic Control and Protection for this project.

If the actual installation and maintenance are to be accomplished by a subcontractor, consent must be requested of the Commissioner at the time of the preconstruction meeting in accordance with Article 108.01 of the Standard Specifications. This must not relieve the Contractor of the foregoing requirement for a responsible individual in its direct employ. The Commissioner will provide to the Contractor the name of its representative who will be responsible for the administration of the Pedestrian Traffic Control Plan. The Contractor must notify the Division of Infrastructure Management at (312) 744-0330 48 hours before commencing construction.

Special attention is called to Articles 107.09 (Public Convenience and Safety) and 107.14 (Maintenance of Traffic) of the Standard Specifications and the following Highway Standards, Details, Supplemental Specifications and Special Provisions, and Recurring Special Provisions contained herein relating to traffic control.

Contractor vehicles must enter or leave work areas in a manner that will not be hazardous to or interfere with normal pedestrian traffic and must not park or stop except within designated work areas. Personal vehicles will not be permitted to park within the right of way except in specific areas designated by the Commissioner.

Pedestrian Traffic Control and Protection details are included in the standard drawings to specify the minimum required combination of traffic control devices in construction areas. Revisions, by the Commissioner, to work or in the phasing of construction operations may require pedestrian traffic control to be installed in accordance with a standard other than those included in the plans; in such cases, the standards will be made available to the Contractor at least one week in advance of the change in Pedestrian Traffic Control. Payment for Pedestrian Traffic Control and Protection required by these added standards will be in accordance with the Article 109.04 of the Standard Specifications. Revisions or modifications to increase the Pedestrian Traffic Control protection shown in the contract must be submitted by the Contractor for approval by the Commissioner. A reduction of the Pedestrian Traffic Control and Protection shown in the contract will not be allowed.

If the Contractor requests and receives approval from the Commissioner to revise or change the

staging of the project from that specified on the plans any additional Pedestrian Traffic Control and Protection required due to that request will be considered incidental to the contract and no additional payment will be made.

All signs, signals, markings, traffic cones, barricades, chain link fence, warning lights, flaggers, and other traffic control devices must conform to the plans, specifications, special provisions and the latest edition of the "State of Illinois Manual on Uniform Traffic Control Devices." The Contractor must obtain, erect, maintain, and remove all Pedestrian Traffic Control and Protection devices in accordance with Article 107.14 of the Standard Specifications. Placement and maintenance of all pedestrian traffic control devices will be as directed by the Commissioner. The Commissioner will be the sole judge as to the acceptability of placement and maintenance of the pedestrian traffic control devices prescribed in the appropriate standards.

The Contractor must insure that all barricades, chain link fence, signs, lights and other devices installed by him are operational every day, including Sundays and holidays. In the event of severe weather conditions, the Contractor must furnish any additional personnel required to properly maintain all pedestrian traffic control devices as directed by the Commissioner.

The Contractor must be responsible for the timely installation, maintenance, relocation and subsequent removal of all temporary signing, barricading and temporary striping necessary to accomplish these detours. The cost of this work will be considered included in the contract lump sum for Pedestrian Traffic Control and Protection.

At the completion of each stage of construction or whenever detour operations indicate that a relocation of a proposed or existing Pedestrian Traffic Control and Protection device is advisable as determined by the Commissioner, the Contractor must remove all pedestrian traffic control devices which were furnished, installed and maintained by him under this contract, and such devices must remain the property of the Contractor. Any pedestrian traffic control devices furnished, installed and maintained by the City will be removed by City forces and will remain the property of the City. All pedestrian traffic control devices must remain in place until specific authorization for relocation or removal is received from the Commissioner.

The Contractor must be aware of the requirements for coordination of all work in this project and adjoining or overlapping projects and for coordination of barricade placement necessary to provide a uniform traffic detour pattern. The Contractor will not be permitted to erect, change or remove its detour barricade system without the prior approval of the Commissioner.

Delays to the Contractor caused by complying with these requirements will be considered incidental to the item for Pedestrian Traffic Control and Protection, and no additional compensation will be allowed.

NOTES: Notes 1 – 9 must be included in the *Pedestrian Traffic Control Plan*.

1. The Contractor must maintain a continuous sidewalk pedestrian zone as specified in the plans along the building face on main arterial and side streets during the construction of each block. The sidewalk must be longitudinally sawcut the cost of which will be considered incidental to SIDEWALK REMOVAL. The Contractor will be allowed to remove and replace this remaining sidewalk but must reopen it for use within 48 hours.

Failure to do so will result in a Pedestrian Traffic Control Deficiency charge for each 24-hour period or portion thereof that said sidewalk is closed.

2. Barricades consisting of temporary 6' fencing with privacy screening on temporary footings with sandbags must be placed the distance specified in the plans from the building face separating the pedestrian zone from the work zone. These barricades must be secure from falling over.
3. Use one "Pedestrian Walkway (Arrow)" (black legend on white reflectorized background) sign at each end of each sidewalk section being reconstructed.
4. At each point of closure, sufficient numbers of barricades must be used to completely close the pathway.
5. Pedestrian walkways must be maintained free of any obstructions and hazards such as holes, debris, mud, construction equipment, stored materials, etc. and must be broom swept daily or as directed by the Commissioner.
6. All hazards near or adjacent to walkways must be clearly delineated.
7. Where construction activities involve sidewalks on both sides of the street, the work must be staged so that both sidewalks are not out of service at the same time.
8. The Contractor must maintain pedestrian access to adjacent properties by installing ADA compliant wood frame-constructed walkways and ramps from the curb line to adjacent property entrances, and at either end of the pedestrian path as directed by the Commissioner. These ramps can be reused, if maintained in acceptable condition, throughout the project. Pedestrian access to adjacent properties must be uninterrupted until the walk is fully restored.
9. The Contractor must maintain disabled person pedestrian access to crosswalks across the main arterial street and side streets at all times via ADA compliant wood frame-constructed walkways and ramps through the work zones. These accesses must be observed and protected by the Contractor at all times, as shown on the M.O.T. plans.
10. A temporary 6' fencing with privacy screening on temporary footings with sandbags will be installed and maintained on either side of the pedestrian wood frame-constructed walkways and along the pedestrian path as shown on the M.O.T. plans.

To ensure a prompt response to incidents involving the integrity of the work zone pedestrian traffic control devices, the Contractor must provide a telephone number where a responsible individual can be contacted on a 24-hour-a-day basis.

When The Commissioner is notified or determines a deficiency exists, the Contractor must dispatch sufficient resources within 2 hours of notification to make needed corrections of deficiencies that constitute an immediate safety hazard or accessibility issue. If the Contractor fails to restore the required pedestrian traffic control and protection within the time limits specified above, the Commissioner will impose a daily monetary deduction for each 24-hour period (or portion thereof) for each deficiency that exists. This time period will begin with the time of notification to the Contractor and end with the Commissioner's acceptance of the corrections. For this project, the daily deduction will be_____* per day.

***CHARGE PER CALENDAR DAY = $2,500.00**

In addition, if the Contractor fails to respond, the Commissioner may correct the deficiencies and

the cost thereof will be deducted from moneys due or which may become due the Contractor. This corrective action will in no way relieve the Contractor of contractual requirements or responsibilities.

In addition any work performed by the Contractor within the work zone that presents a hazard to vehicular or pedestrian traffic must be subject to charges for PEDESTRIAN TRAFFIC CONTROL DEFICIENCY.

Debris removal, fly dumping, proper access to abutting property, timely and correct placement of short term, temporary and permanent pavement markings, along with all items of work contained within this item are also subject to this charge.

Method of Measurement: Pedestrian Traffic Control and Protection will be measured as lump sum price.

Basis of Payment: The work under this item will be paid for at the contract lump sum price as shown in the Schedule of Unit Prices for PEDESTRIAN TRAFFIC CONTROL AND PROTECTION, which price will be payment in full for all labor, materials, transportation, handling and incidentals necessary to furnish, install, maintain, and remove all traffic control devices required by the appropriate standards and as approved by the Commissioner. No adjustment or additional compensation will be allowed except as specified herein. The salvage value of the materials removed will be reflected in the bid price for this item.

ITEM 87 - ******** - MAINTENANCE OF ACCESS TO ABUTTING PROPERTY

Description: This work under this item shall include furnishing all labor, materials, tools and equipment required for the Maintenance of Access to Abutting Property, including but not limited to the furnishing, transporting, placing, maintaining, removing, and disposing of all materials used for maintenance of access to abutting property during the construction of this project. Work under this item shall be performed according to the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

General Requirements: The Contractor shall at all times conduct the work in such a manner as to insure the least obstruction to vehicular and pedestrian traffic. The convenience of the general public and of residents along the involved streets shall be provided for in an adequate and satisfactory manner as directed by the Commissioner.

The Contractor shall provide and maintain acceptable, temporary access from the street being improved to abutting side streets, alleys, driveways, parking lots, building, houses and/or other property where egress and ingress is required. The temporary access shall be provided using the various means listed below:

1. Steel cover plates of the proper size and strength to span the work area;
2. Wood ramps and boards with railings, spanning the work zone;
3. Pedestrian barricades;
4. Crushed stone;
5. Or, other means approved by the Commissioner.

All signs, signals, markings, traffic cones, barricades, chain link fence, warning lights, flaggers, and other traffic control devices must conform to the plans, specifications, special provisions and the latest edition of the "State of Illinois Manual on Uniform Traffic Control Devices."

Temporary access shall meet ADA requirements. In addition, site cleanliness must be maintained at all times both inside and outside the work zone areas. To ensure a prompt response to incidents involving the integrity of the work zone access devices, the Contractor must provide a telephone number where a responsible individual can be contacted on a 24-hour-a-day basis.

When the Commissioner is notified or determines a deficiency exists, the Contractor must dispatch sufficient resources within 2 hours of notification to make needed corrections of deficiencies that constitute an immediate safety hazard. If the Contractor fails to restore the required maintenance of access control and protection within the time limits specified above, the Commissioner will impose a daily monetary deduction for each 24-hour period (or portion thereof) the deficiency exists. This time period will begin with the time of notification to the Contractor and end with the Commissioner's acceptance of the corrections. For this project, the daily deduction will be *_____ per day.

*** CHARGE PER CALENDAR DAY = $1,500.00**

In addition, if the Contractor fails to respond, the Commissioner may correct the deficiencies and the cost thereof will be deducted from moneys due or which may become due the Contractor. This corrective action will in no way relieve the Contractor of contractual requirements or responsibilities. In addition any work performed by the Contractor within the work zone that presents a hazard to vehicular or pedestrian traffic will be subject to charges for Vehicular Traffic

Control Deficiency, and / or Pedestrian Traffic Control and Protection Deficiency. Debris removal, fly dumping, proper access to abutting property, timely and correct placement of short term, temporary and permanent pavement markings, along with all items of work contained within this item are also subject to this charge.

When permanent access has been re-established, the materials used for temporary access shall be removed by the Contractor and shall become his property for disposal thereof. However, he may use the same material in other locations to provide temporary access if approved by and as directed by the Commissioner.

Method of Measurement: Maintenance of Access to Abutting Property will be measured for payment on a lump sum basis. Any and all materials, labor and equipment required to provide temporary access as specified herein will not be measured for payment but the cost there of considered incidental to this item.

Basis of Payment: This item of work shall be paid for at the contract lump sum price for MAINTENANCE OF ACCESS TO ABUTTING PROPERTY, which shall be payment in full for all labor, materials, and equipment including but not limited to the furnishing, transporting, placing, maintaining, removing, and disposing of all materials used for providing temporary access as herein specified. The salvage value of the materials removed will be reflected in the bid price for this item.

ITEM 98 - 70307100 - TEMPORARY PAVEMENT MARKING LETTERS AND SYMBOLS - TYPE IV TAPE
ITEM 99 - 70307120 - TEMPORARY PAVEMENT MARKING - LINE 4" - TYPE IV TAPE
ITEM 100 - 70307130 - TEMPORARY PAVEMENT MARKING - LINE 6" - TYPE IV TAPE
ITEM 101 - 70307210 - TEMPORARY PAVEMENT MARKING - LINE 24" - TYPE IV TAPE
ITEM 102 - X7030005 - TEMPORARY PAVEMENT MARKING REMOVAL

Description: Work under these items shall be performed in accordance with BDE Special Provision - Temporary Pavement Marking (Revised April 1, 2017).

ITEM 107 – Z0062456 - TEMPORARY PAVEMENT

Description: Work under this item shall be performed in accordance with Sections 353, 354, 355, 356, and 358 of the Standard Specifications except as herein modified.

This work shall include all materials, labor and equipment necessary to construct, remove and dispose of Temporary Pavement at the locations shown on the plans or as directed by the Engineer.

Materials:

	Article/Section
Portland Cement Concrete	1020
Hot-Mix Asphalt Base Course	1030

Construction Requirements: The Temporary Pavement, at the option of the contractor, must be either 8" PCC Base Course or 10" Hot-Mix Asphalt Base Course. The temporary pavement must be constructed in accordance with the Standard Specifications and details in the plans.

No extra compensation will be given for the construction of the Temporary Pavement in the winter months with PCC Base Course.

Method of Measurement: This work will be measured for payment in place in square yards.

Basis of Payment: This work will be paid for at the contract unit price per square yard for TEMPORARY PAVEMENT, which price will include payment in full for all materials, labor and equipment necessary to perform the work as here in specified. Removal of the temporary pavement and any surface placed over it will be incidental to this item and not measured separately for payment.

ITEM 113 - ***** - METHYL METHACRYLATE PAVEMENT COLORIZATION, GREEN**
ITEM 114 - ***** - METHYL METHACRYLATE PAVEMENT COLORIZATION, WHITE**
ITEM 115 - ***** - METHYL METHACRYLATE PAVEMENT COLORIZATION, YELLOW**

Description: The work will include the application of Methyl Methacrylate (MMA) Acrylic high friction colorized surface for Bus Lane and Bike Lanes. The colorized surfaces shall be applied according to the manufacturer's specifications and as amended in these specifications.

Materials: The MMA acrylic bike lane pavement marking material must be Methyl Methacrylate Acrylic material with Green pigment for bike lanes and Red pigment for bus lanes and include anti-skid abilities as described below. Color pigmented resins shall comply with FHWA color guidelines

1. Pigmented Resin.
    a. Color pigmented resins shall comply with FHWA color guidelines

2. Anti-Skid Aggregate.
    a. For all designated bike lanes, a durable aggregate with a minimum hardness of 7.0 per Mohs Hardness Scale must be used and incorporated into the 'Green' pigmented MMA acrylic resin.
    b. For all designated bus lanes, calcined bauxite with a minimum hardness of 8.5 per Mohs Hardness Scale must be used and incorporated into the 'Red' pigmented MMA acrylic resin.

Submittals:

1. Product Data describing physical and performance characteristics and colors available
2. Material Certification: Provide a Manufacturer's written certification that the material complies with these specifications.
3. Samples: Submit manufacturer's sample of materials, finishes, and colors
4. Quality Control Plan
    - Description of equipment for placing MMA
    - Description of equipment for measuring, mixing, placing, and finishing MMA
    - Method for protecting areas not to receive MMA
    - Cure time estimates for MMA
    - Storage and handling of MMA components
    - Disposal of excess MMA and containers
    - Contingency plan for possible failure during the MMA application including remediation

Construction Requirements:
Construction of bus lane and bike lane pavement markings shall be in accordance with manufacturer application and installation procedures, Standard Specifications for Construction, and Engineer.

All pavement marking areas shall be laid out by the contractor and then reviewed by the Engineer. Approval of the marking layout shall be approved by the Engineer prior to placement of

material.

Surface preparation shall include cleaning and preparation of the pavement surface using high pressure water, compressed air, sand-blasting or shot-blasting. Both asphalt and concrete surfaces shall be prepared and approved by the material manufacturer and the engineer. Concrete surfaces shall require shot blasting preparation in addition to any other methods of preparation used. All surface damage shall be corrected by the Contractor at the Contractor's expense, as directed by the Engineer. Manufacturer recommended pavement and air temperatures must be followed.

New Hot Mix Asphalt shall have been placed 15-30 days prior to installation of the MMA acrylic colorized material and surface oils shall not be present. MMA acrylic colorized material applied on concrete surfaces shall receive a base coat application and shall be included in the pay item. Marking layout, material mixing, base coat application, and pigmented coat application shall comply with the manufacturer's installation procedures.

The Contractor shall protect the pavement markings from damage and allow them to fully cure prior to allowing traffic to drive over markings. Any damage shall be corrected by the Contractor at the Contractor's expense.

Method of Measurement: The quantity to be paid will be the area in square feet of METHYL METHACRYLATE PAVEMENT COLORIZATION of the color specified, measured in place, completed and accepted.

Basis of Payment: This work will be paid for at the Contract Unit Price per square foot for METHYL METHACRYLATE PAVEMENT COLORIZATION, GREEN, METHYL METHACRYLATE PAVEMENT COLORIZATION, WHITE, and METHYL METHACRYLATE PAVEMENT COLORIZATION, YELLOW, which price will include all material, labor, equipment, and surface preparation needed for the installation.

ITEM 121 - ****** - REMOVE AND RELOCATE SIGN PANEL**

Description: Work under this item shall be performed according to Section 724 of the IDOT Standard Specifications for Road and Bridge Construction and the current City of Chicago Department of Transportation Manual for Sign Installation, except as herein modified.

This work shall consist of removing, storing in a safe location, and relocating a sign panel without pole assembly to a new location as shown on the plans and/or work order or as directed by the Commissioner.

General Requirements: Existing sign panels which must be removed and relocated where directed consist of the mounted sign panels, sleeves, wedges, bases and other associated hardware. The Contractor must remove the sign panels and hardware from the locations indicated in such a manner that the materials are not damaged by the Contractor's work.

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

Basis of Payment: This work will be paid for at the contract unit price per each for REMOVE AND RELOCATE SIGN PANEL and shall include all equipment, materials and labor required for the satisfactory removal and reinstallation of the existing sign panel at a new location.

ITEM 122 - ****** - REMOVE AND SALVAGE SIGN PANEL**
ITEM 123 - ****** - REMOVE EXISTING SIGN PANEL AND POST ASSEMBLY AND SALVAGE**

Description: Work under these items shall be performed in according to Section 724 of the Standard Specifications, and the latest version of the City of Chicago Department of Transportation's Field Manual For Sign Installation, except as modified herein.

Work under these items consists of removing existing Sign Panels from light poles and traffic signal posts, and removal of existing Sign Panel and Pole Assemblies which consist of poles in ground, base mounted poles, embedded poles in concrete, the mounted sign panels, sleeves, wedges, bases and other associated hardware, grouting or filling resulting holes.

General Requirements: The contractor will deliver all salvaged Sign Panels and Sign Panel and Pole Assemblies to the Bureau of Signs and Markings, 3458 South Lawndale Avenue, Chicago, Illinois 60623. The Contractor must contact the Bureau (312-747-2210) at least 24 hours in advance to arrange delivery of salvaged Sign Panels, Sign Panel and Pole Assemblies. The Contractor will obtain a receipt for all the delivered Sign Panels and Sign Panel and Pole Assemblies from the Superintendent of Signs Division and submit the same to the Commissioner within 24 hours of delivery.

Construction Requirements: In the case of removal of a pole installed in a parkway the Contractor will fill and compact the hole with approved fill materials.

In the case of removal of base mounted poles installed in sidewalk, the extruding bolts shall be sawed flush to the sidewalk surface immediately. Failure to remove the extruding bolts immediately after the removal of base would result in the charging of traffic control liquidated damages as specified under TRAFFIC CONTROL AND PROTECTION, (SPECIAL).

In the case of removal of poles embedded in sidewalk, the pole must be sawed flush to the sidewalk surface and grouted with approved materials to close the open pipe.

Method of Measurement: This work will be measured for payment per each sign or sign and pole assembly removed and salvaged.

Basis of Payment: This work will be paid at the contract unit price per each for REMOVE AND SALVAGE SIGN PANEL or REMOVE EXISTING SIGN PANEL AND POST ASSEMBLY AND SALVAGE.

ITEM 124 - ****** - FURNISH AND INSTALL POLE AND BASE**

Description: This work consists of furnishing sign poles of various lengths and installation either by dig method or drill method as shown in the Contract Drawings. The poles installed using dig method shall be 11 feet and 6 inches in length and the poles installed using drill method shall be 10 feet and 6 inches in length. The cost of wedges, sleeves, pole bases and all other required hardware to install poles is included in the cost of these items.

Sign Poles:

Materials: The material for the poles furnished must be hollow steel tubes, 2 - 3/8 inches outside diameter, conforming to ASTM A500 Grade B and coated for resistance to corrosion and outdoor weathering. Nominal wall thickness of the pole must be 0.08". The sign pole must be formed to the size and type specified in the Contract Drawings. Holes must be drilled prior to coating to prevent indentations and dimples in the poles.

Finish: The poles must be galvanized, straight and have a smooth, black, uniform powder coating finish as specified below. The interior of the sign poles must be coated with a minimum of an 81% zinc rich primer. The exterior of the poles must be galvanized with material conforming to AASHTO M 120 with a minimum weight of 1.00 ounce per square foot. The weight of the exterior galvanizing may be reduced to 0.65 ounces per square foot of High Grade material conforming to AASHTO M 120 if applied with a chromate conversion coating and a clear high performance organic polymer coating. Powder coating of the poles and extensions must meet the following requirements:

Color: Vulcan Black Polyester
Product No.: PFB-401-S6
Cure: 400F - 18 minutes PMT
Resin type: Polyester
Gloss: Medium

Pretreatment Process:

Cleaning: All parts must be cleaned utilizing spray washers and an alkaline cleaner to remove any remaining grease, dirt, or other contaminants.

Rinsing: All parts must be spray rinsed in a continuously overflowing rinse stage to remove any remaining cleaning solution.

Phosphating: All parts must be spray phosphated with a heated phosphate solution to provide a transition coating between metal and powder.

Rinse: All parts must be spray rinsed in a continuously overflowing rinse stage to remove any remaining phosphate / sealant solution.

Powder Coating Process:

Drying: All parts must be preheated to totally eliminate moisture and prevent offgassing of casting.

Powder Coating: A premium TGIC polyester powder must be electrostatically applied to provide a uniform coating to a thickness of 1-3 mils (1 mil minimum). To achieve proper mil thickness, the powder must be applied with one application. The manufacturer must be responsible for ensuring proper adhesion to the metal surface.

Curing: All parts must be heated to the exact time and temperature requirements, recommended by the powder coat material manufacturer, in precisely controlled gas ovens.

Sleeve and Locking Wedge:

Pole sleeve (pipe socket): Material must be hollow steel tubes conforming to ASTM A500 Grade B or ASTM A501, and galvanized according to AASHTO M111, nominal wall thickness of 0.109", 2-5/8 inch inside diameter that allows for a minimum of 13-1/4 " of sign pole to nest inside the sleeve. The overall length of pole sleeve must be 27".

Locking wedge: Material shall be 11 gauge steel tube conforming to ASTM A500 Grade B or ASTM A501 and galvanized according to AASHTO M111. The locking wedge shall be contoured to fit between the steel pole and the 27-inch sleeve.

Sign Pole Base:

The sign pole base furnished under this contract includes a carriage bolt, tamper resistant nuts, and anchor bolts with nuts. The finished casting must be free from burrs, cracks, voids, or other defects.

Support base: Twelve-inch diameter, aluminum -zinc alloy casting per ASTM A197. The casting must have the words "City of Chicago" cast in relief.

Bolt washers and nut: Stainless steel as specified in Article 1006.31(a) of the Standard Specifications. Include a 1" x 4-1/2"carriage bolt with two 1" flat washers and a 1" x 13 full height hex nylon locknut.

Anchor Bolt: Galvanized steel expansion anchors conforming to Article 1006.09 of the Standard Specifications. Red Head #1236 (1/2" x 3-3/4"). Furnish three per each sign base provided.

Finish: Powder coat to minimum 1 mil thickness with satin black polyester finish.

Submittals:

Shop Drawings: Fabrication shop drawings showing the layout, color, and proposed materials for poles, bases, and hardware must be submitted for approval prior to start of fabrication.

Poles: Mill certification, samples of each size of finished pole and extension.

Locking wedge and sleeve: Samples of each item.

Cast aluminum base: Mill Certifications.

Powder coating: Test Data; Sample; Manufacturer's Certification that material complies with the required specifications.

Galvanizing: Manufacturer's Certification for compliance with these specifications.

Stainless steel bolts and nuts, anchor bolts: Sample, product data sheet.

Material Acceptance: The Contractor must provide a Manufacturer's written certification that the material complies with these specifications.

Installation: All installation shall be performed in accordance with Article 720.04 of the Standard Specifications and as per the details provided in the plans.

Dig Method: To install a sign pole by dig method, the Contractor will first drive a base sleeve to a level with the top of the sleeve near flush to the ground. The sign pole will then be inserted into the sleeve and raised to a level with the bottom of the pole 10 to 12 inches below the ground. The sign pole will then be locked in place by driving a locking wedge between the sign pole and the base sleeve. Note: Pipe sleeve and wedge shall not be bolted together. The holes at the top of the sign pole will be properly aligned such that the sign to be installed will properly face the flow of traffic.

Drill Method: The base will be secured to the concrete surface by steel expansion anchors and must be leveled by using stainless steel washers as shims at the anchor bolt locations and under the base castings. The sign pole will be installed into the cast iron base and locked in place with a carriage bolt with two flat washers and a nylon lock nut as shown in the plans. The holes at the top of the sign pole must be aligned such that the sign to be installed will properly face the flow of traffic.

Sign poles will be installed 18” from back of curb unless otherwise specified. Poles for transportation stops, e.g. bus, taxi, tour bus, or tour boat stops, must be installed 24” from the back of the curb unless otherwise noted.

Method of Measurement: Poles must be measured on the basis of each pole furnished and installed under the specified method.

Basis of Payment: This work will be paid for at the contract unit price each for FURNISH AND INSTALL POLE AND BASE. The cost of poles, all sleeves, locking wedges, bases and all other required hardware to complete the installation of poles will be included in the cost of the items.

ITEM 125 - ****** - SIGN PANEL - TYPE 1 - RETROREFLECTIVE - TYPE A - SINGLE-SIDED**
ITEM 126 - ****** - SIGN PANEL - TYPE 1 - RETROREFLECTIVE - TYPE A - DOUBLE-SIDED**
ITEM 127 - ****** - SIGN PANEL - TYPE 1 - NON-REFLECTIVE - DOUBLE-SIDED**

Description: Work consists of furnishing and/or fabricating reflectorized and non-reflectorized sign panels complete with sign faces, legend, and supplemental panels, and installing them on previously erected sign support(s), sign structures, traffic signal poles, traffic signal mast arms, light poles, columns, piers, or bridges.

Work must be performed in accordance with the requirements of Section 720 of the Standard Specifications and the latest version of the City of Chicago Department of Transportation (CDOT) Field Manual for Sign Installation. Standard traffic signs designated by letters and numbers must be according to the Manual on Uniform Traffic Control Devices. Non-standard signs must be according to the CDOT Field Manual for Sign Installation and Detailed Drawings.

Submittals:

A. Shop Drawings: Fabrication shop drawings showing full size sign layout, color, message (including "City of Chicago" logo and date of sign fabrication), graphics and proposed materials for each sign assembly, including poles, bases and hardware, must be submitted for approval prior to start of fabrication. Similar sign types that have the same sizes, colors, symbols and text layout must be submitted using one full size sign layout. Note: The message "City of Chicago XX", where XX represents the last two digits of the calendar year of sign manufacture, must be screened on all signs furnished under this contract. For stock items, submit manufacture's catalog sheets for approval before shipping the order.

B. Materials:
   1. Aluminum: Mill Certifications, Samples

   2. Powder Coating: Test Data; Sample; Manufacturer's Certification that material complies with the required specifications.

   3. Sign Face Material: Test Data; Samples; Manufacturer's Certification that material complies with the required specifications. Test Data must be gathered by an independent agency, such as AASHTO's National Transportation Product Evaluation Program (NTPEP). Test data must cover retroreflective sheeting and process inks and/or overlay films manufactured by the sheeting manufacturer in standard traffic colors.

C. Samples: Submit one sample for each sign type

D. Material Acceptance: The Contractor must provide a Manufacturer's written certification that the material complies with these specifications.

E. Maintenance Instructions: Submit manufacturer's printed instructions for maintenance of each product, coating and film, including precautions for use of cleaning materials and solvents for paint removal which could damage specified materials.

Method of Measurement: The Sign Panels will be measured for payment in square feet of furnished and delivered sign panel. The area used for measurement will be the area of the

smallest rectangle that will circumscribe each individual sign panel measured from edge to edge (horizontally and vertically). Double sided signs will be measured by the overall dimension of the complete panel, and not per face. Work will include all labor and materials necessary to install the sign. Mounting hardware and appurtenances are included in the work and will not be measured separately for payment.

Basis of Payment: This work will be paid for at the contract unit price per square foot of SIGN PANEL - TYPE 1 - NON-REFLECTIVE - SINGLE-SIDED, SIGN PANEL - TYPE 1 - RETROREFLECTIVE - TYPE A - SINGLE-SIDED, SIGN PANEL - TYPE 1 - NON-REFLECTIVE - DOUBLE-SIDED, and SIGN PANEL - TYPE 1 - RETROREFLECTIVE - TYPE A - DOUBLE-SIDED for a fabricated, furnished, delivered, and installed sign. The cost of relocating existing signs within a given assembly in order to properly install the items shall be incidental to the unit prices of the items.

ITEM 128 - ****** - STREET NAME SIGNS**

Description: Work consists of furnishing and/or fabricating reflectorized and non-reflectorized sign panels complete with sign faces, legend, and supplemental panels, and installing them on previously erected sign support(s), sign structures, traffic signal poles, traffic signal mast arms, light poles, columns, piers, or bridges.

Work must be performed in accordance with the requirements of Section 720 of the Standard Specifications and the latest version of the City of Chicago Department of Transportation (CDOT) Field Manual for Sign Installation. Standard traffic signs designated by letters and numbers must be according to the Manual on Uniform Traffic Control Devices. Non-standard signs must be according to the CDOT Field Manual for Sign Installation and Detailed Drawings.

Submittals:

A. Shop Drawings: Fabrication shop drawings showing full size sign layout, color, message (including "City of Chicago" logo and date of sign fabrication), graphics and proposed materials for each sign assembly, including poles, bases and hardware, must be submitted for approval prior to start of fabrication. Similar sign types that have the same sizes, colors, symbols and text layout must be submitted using one full size sign layout. Note: The message "City of Chicago XX", where XX represents the last two digits of the calendar year of sign manufacture, must be screened on all signs furnished under this contract. For stock items, submit manufacture's catalog sheets for approval before shipping the order.

B. Materials:

   1. Aluminum: Mill Certifications, Samples

   2. Powder Coating: Test Data; Sample; Manufacturer's Certification that material complies with the required specifications.

   3. Sign Face Material: Test Data; Samples; Manufacturer's Certification that material complies with the required specifications. Test Data must be gathered by an independent agency, such as AASHTO's National Transportation Product Evaluation Program (NTPEP). Test data must cover retroreflective sheeting and process inks and/or overlay films manufactured by the sheeting manufacturer in standard traffic colors.

C. Samples: Submit one sample for each sign type.

D. Material Acceptance: The Contractor must provide a Manufacturer's written certification that the material complies with these specifications.

E. Maintenance Instructions: Submit manufacturer's printed instructions for maintenance of each product, coating and film, including precautions for use of cleaning materials and solvents for paint removal which could damage specified materials.

Method of Measurement: The Sign Panels will be measured for payment in square feet of furnished and delivered sign panel. The area used for measurement will be the area of the smallest rectangle that will circumscribe each individual sign panel measured from edge to edge (horizontally and vertically). Double sided signs will be measured by the overall dimension of the

complete panel, and not per face. Work will include all labor and materials necessary to install the sign. Mounting hardware and appurtenances are included in the work and will not be measured separately for payment.

Basis of Payment: This work will be paid for at the contract unit price per square foot of STREET NAME SIGNS for a fabricated, furnished and delivered sign.

ITEM 129 - ****** - TUBULAR FLEXIBLE DELINEATOR**

Description: This work shall consist of furnishing and installing Flexible Delineators on asphalt and concrete pavement and open metal grating on bridges.

General Requirement: Contractor shall provide new and unused low density polyethylene Flexible Delineator post, fastening screws, base, and anchor bolts. Must be engineered to meet Manual on uniform Traffic Control Devices (MUTCD) specifications for nighttime use including, but not limited to (1) height of 28" and (2) provide two 3" wide white or yellow retroreflective bands placed 2" from the top and spaced 3" between the bands. All colors must be within tolerance limits as specified in the MUTCD and 23 CFR Part 655, Appendix to Subpart F. All bands shall meet MUTCD retroreflectivity requirements. Flexible delineators shall be made of materials resistant to extreme temperature changes in the range of -20 F to 160 F, ultraviolet light, ozone, hydrocarbons, stiffening with age, and a series of direct wheel impacts with speeds varying up to 65 mph, and rebounds to a vertical position if struck be a standard vehicle. Units shall meet NCHRP 350 crashworthy requirements.

Post locations and color combinations are specified on plan sheets. Contractor shall be prepared to install the following post and band colors combinations. All bases shall be black.

- White post with white band
- Yellow post with yellow band

Contractor shall affix heavy duty base to pavement or metal grating with 2.5" anchor bolts. Heavy duty base shall be designed to hold the post securely to the pavement with 2.5" anchor bolts. Post shall be affixed to the base with fastening screws. Anchor bolts shall be one-piece finished hex head, integral washer, dual lead threads and chamfered tip for installation in concrete or asphalt. One-piece bolts shall be used to eliminate improper assembly, dual threaded bolts shall be used to prevent bolts spinning in holes when tightened. All units shall be completely removable with standard power tools.

Method of Measurement: The flexible delineator shall be measured on a per each basis, for each entire assemble installed and accepted. The entire assembly shall include post, fastening screws, base and anchor bolts.

Basis of Payment: TUBULAR FLEXIBLE DELINEATOR shall be paid for at the contract unit price per each unit installed and accepted.

ITEM 130 - ******* - REMOVE BIKE RACK**

Description: This work shall consist of removing the existing bike racks in the sidewalks at the locations shown on the plans.

Construction Requirements: The existing bike racks shall be removed at the time the existing sidewalk is demolished. The removed bike racks shall become the property of the Contractor.

Method of Measurement: This work will be measured for payment per each for REMOVE BIKE RACK

Basis of Payment: This work will be paid for at the contract unit price per each for REMOVE BIKE RACK which price shall include all equipment, labor, and materials necessary to remove the bike rack.

ITEM 131 - ****** - REMOVE BENCH**

Description: This work shall consist of removing the existing benches in the sidewalks at the locations shown on the plans.

Construction Requirements: The existing benches shall be removed at the time the existing sidewalk is demolished. The removed bench shall become the property of the Contractor.

Method of Measurement: This work will be measured for payment per each for REMOVE BENCH

Basis of Payment: This work will be paid for at the contract unit price per each for REMOVE BENCH which price shall include all equipment, labor, and materials necessary to remove the bench.

ITEM 132 - ****** - REMOVE AND RELOCATE EXISTING CONCRETE PLANTER**

Description: This work shall consist of removing the existing concrete planters in the sidewalks at the locations shown on the plans.

Construction Requirements: The existing concrete planters shall be removed at the time the existing sidewalk is demolished. The removed concrete planter shall become the property of the Contractor.

Method of Measurement: This work will be measured for payment per each for REMOVE AND RELOCATE EXISTING CONCRETE PLANTER.

Basis of Payment: This work will be paid for at the contract unit price per each for REMOVE AND RELOCATE EXISTING CONCRETE PLANTER which price shall include all equipment, labor, and materials necessary to remove the planter.

ITEM 133 - ******* - REMOVE TRASH RECEPTACLE**

Description: This work shall consist of removing the existing trash receptacles in the sidewalks at the locations shown on the plans.

Construction Requirements: The existing trash receptacles shall be removed at the time the existing sidewalk is demolished. The removed trash receptacles shall become the property of the Contractor.

Method of Measurement: This work will be measured for payment per each for REMOVE TRASH RECEPTACLE

Basis of Payment: This work will be paid for at the contract unit price per each for REMOVE TRASH RECEPTACLE which price shall include all equipment, labor, and materials necessary to remove the trash receptacle.

ITEM 134 - X0327552 - TREE GRATE REMOVAL

Description: This work shall consist of removing the existing tree grates in the sidewalks at the locations shown on the plans.

Construction Requirements: The existing tree grates shall be removed at the time the existing sidewalk is demolished. The Contractor shall be careful in removing the frames and grates so as not to damage the trees. The removed frames and grates shall become the property of the Contractor.

Method of Measurement: This work will be measured for payment per each for TREE GRATE REMOVAL

Basis of Payment: This work will be paid for at the contract unit price per each for TREE GRATE REMOVAL which price shall include all equipment, labor, and materials necessary to remove the tree frame and grate.

ITEM 136 - X0426200 - DEWATERING

Description: This work shall consist of any dewatering within the project limits as required for construction for the duration of the project, including any dewatering required for installation of the storm sewer and other underground infrastructure. Water shall be routed through a filter bag or equivalent practice before discharging into the sewer. The Contractor may either pump or trench to the dewatering areas. It will be the responsibility of the Contractor to provide written documentation to the Engineer detailing the proposed dewatering method and the proposed sediment and erosion control measures to be implemented. The Contractor shall obtain the approval of the Engineer prior to implementing the proposed dewatering plan. The sediment and erosion control measures in regard to dewatering as approved by the Engineer shall be included in the contract unit price for DEWATERING.

Upon completion of the project or the removal of erosion and sediment control devices, the Contractor will be responsible for excavating all sediment that has been trapped in the Temporary Dewatering Area to the satisfaction of the Engineer. This work will also be included in the contract unit price for DEWATERING.

Method of Measurement: Dewatering shall not be measured for payment, but will be paid for per lump sum for DEWATERING which price shall include any required dewatering for the duration of the project, including all labor, equipment, and materials required.

Basis of Payment: DEWATERING will be paid for at the contract unit price per lump sum. This price shall include all equipment, labor and materials required to complete the work as specified.

ITEM 137 - ****** - DOMESTIC WATER SHUT-OFF BOXES AND VALVE BOXES TO BE ADJUSTED**

Description: Work under this item shall be performed according to Sections 602 of the Standard Specifications, except as herein modified. This work shall consist of the adjustment of existing water shut-off boxes and valve boxes located in existing or proposed sidewalks, parkways, or roadways.

Materials:

- Shut-off / valve box tubing: ASTM D-1788 Rigid Acrylonitrile-Butadiene-Styrene (ABS) Plastic
- Cast iron lid / rim: ASTM A-48 Gray Iron Castings
- Backfill: Article 1003.04

General Requirements: The Contractor will not be permitted to operate service control valves or any line valves of the water distribution system. If any damage is caused to the water service box, the Department of Water Management personnel will repair or replace them and charge the cost to the Contractor. Payment to the Contractor, in the amount of the damages, will be withheld until the damages are resolved with the Department of Water Management.

The Contractor must obtain copies of water service pipe plats and any plumbing inspections from the Department of Water Management to verify the exact location of the domestic water shut-off box(es) to be adjusted. The Contractor must notify the Department of Water Management 72 hours in advance before the removal of sidewalk or parkway commences so that the Department of Water Management can provide a field inspector to determine if the service is in use or not and to clarify any discrepancies in the service pipe plats or field survey. A representative of the Contractor shall accompany the field inspector during the field survey.

Under no circumstance shall an adjustment not be completed in the same day as it is started. Under no circumstance shall debris be left in the street overnight. The Contractor shall stage adjustment work so that the traffic flows in a safe manner.

Construction Requirements: The Contractor shall vertically adjust existing domestic water shut-off boxes or valve boxes to the proper surface elevation. If a water service is inactive, the contractor must cut-off the top part of the shut-off box / valve box 18-inches below the proposed grade and backfill.

If the water service is active and the shut-off / valve box is made of plastic or other approved materials, the Contractor must excavate and vertically adjust the box to proposed grade. This work will be considered incidental to the contract.

If the existing shut-off / valve box is made of cast iron, the top 18-inches of the box must be replaced with a length of plastic tubing sleeved over the existing shut-off / valve box. The cast iron rim must be bonded to the top of the plastic tubing.

QC/QA Requirements: The Contractor must provide the Manufacturer's written certification that indicates material complies with these specifications.

Method of Measurement: This work will be measured per each.

Basis of Payment: This work will be paid for at the contract unit price per each for DOMESTIC WATER SHUT-OFF BOXES AND VALVE BOXES TO BE ADJUSTED.

ITEM 138 - Z0017400 - DRAINAGE & UTILITY STRUCTURES TO BE ADJUSTED

Description: This work shall be performed according to Section 602 of the Standard Specifications, except as herein modified.

This work shall consist of the vertical and horizontal adjustment of existing catch basins, manholes, inlets, valve vaults, water meter vaults or City Electric manholes.
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Work may include excavation necessary to expose adjustment rings or cones and the work to rotate, reconstruct, or laterally relocate the adjustment ring/cone and/or manhole frame and lid to the new location immediately adjacent to the existing structure.

This work shall include the first three feet of masonry required to be added, removed or rebuilt to bring the specified casting to the finished grade of the proposed improvement.

Material: The Cement Factor shall be a minimum of 7.35 cwt. The mix shall be designed according to Section 3.0 of the IDOT QC/QA PCC Level III Technician Manual. High early strength concrete must achieve a minimum compressive strength of 3,500 psi within 3 days of placement.

The use of HMA for pavement patching is not allowed.
The use of HDPE plastic adjusting rings (602.02(l)) is not allowed.
The use of Recycled Rubber Adjusting rings (602.02(m)) is not allowed.

General Requirements: Under no circumstance will an adjustment not be completed in the same day as it is started. Under no circumstance will any debris be left in the street overnight. The Contractor must stage adjustment work so that the traffic flows in a safe manner.

For sewer manholes, prior to starting construction, an inspection of all the existing structures, shall be made by the Commissioner and the Contractor to determine the amount of existing debris in these structures.

Prior to working on City Electric manholes, the Contractor must notify the Office of Emergency Management and Communications (OEMC) a minimum of 3 weeks prior to conducting the work. Contact:

Frank Kelly or Jeff Cairns
1345 W. Madison St.
Chicago, IL 60607
(312) 746-4414

Upon completion of all work, the Contractor must clean structures as follows: catch basins must be cleaned of all construction debris and existing debris must be removed to one foot below the half trap; inlets and manholes must be cleaned of all construction and existing debris.

Method of Measurement: This work will be measured per each item adjusted.

Basis of Payment: This work will be paid for at the contract unit price per each for DRAINAGE & UTILITY STRUCTURES TO BE ADJUSTED.

ITEM 139 - Z0018500 - DRAINAGE STRUCTURES TO BE CLEANED

Description: Work under this item shall be performed in accordance with IDOT District 1 Special Provision Cleaning Existing Drainage Structures. (Effective: September 30, 1985; Revised December 1, 2011).

ITEM 140 - Z0018905 - DRILL AND GROUT BARS

Description: Work under this item shall be performed in accordance to Sections 442, 420, and 1000 of the Standard Specifications, except as herein modified.

The work shall consist of furnishing and installing #5 epoxy coated dowel bars or epoxy coated tie bars in existing Portland Cement Concrete (P.C.C.) bases where new P.C.C. Curbs and Gutters, new P.C.C. Bases and pavement patches are poured against existing P.C.C. Bases at locations shown on the Plans and as designated by the Commissioner. Dowel bars and tie bars between proposed sections are not included in this item but are included in the cost of the proposed sections.

General Requirements: Materials for a #5 dowel bar shall meet the requirements of Article 1006.06 of the Standard Specifications for Dowel Rods and Article 1024.01 of the Standard Specifications for Non-shrink Grout or one of the approved chemical adhesives as listed by the Bureau of Materials and Physical Research. Epoxy adhesive shall not be allowed.

Bars shall be located as indicated on the plans. Individual bar locations shall be shifted at least 5 inches away from existing cracks, joints and unsound concrete.

Holes for dowel bars shall be drilled with suitable equipment for this purpose to the depth shown and to a diameter large enough to allow grouting around the dowel bar or tie bar. The dowel bars or tie bar shall be secured in the drilled holes with non-shrink grout. The grout shall be allowed to cure before the concrete for new curbs and gutters and bases are poured.

Method of Measurement: This work is to be measured on a per each basis.

Basis of Payment: This work will be paid for at the contract unit price per each for DRILL AND GROUT BARS.

ITEM 141 - Z0036200 - PAINT CURB

Perform work under this item in accordance with Section 780 of the Standard Specifications, except as herein modified.

Description: This item consists of furnishing all labor, materials, tools and equipment for surface preparation and application of paint to the face and top of curb as indicated on the plans or as directed by the Commissioner.

General Requirements: Prior to application of the paint, the contractor shall make certain the surface to be painted is dry and free of dirt or grease and, if necessary, clean the surface to the satisfaction of the Commissioner.

Materials shall meet the requirements of Article 1095.02

The color of paint shall be white or yellow, as indicated on the plans.

See Pavement Marking Sheets for details.

Method of Measurement: PAINT CURB will be measured for payment in feet along the flow line of the gutter along the face of the curb. This work shall be paid for as PAINT CURB regardless of the height or type of curb to be painted.

Basis of Payment: This work will be paid for at the contract unit price per foot, measured as specified, for PAINT CURB; which shall include all labor, tools, equipment required to paint curbs as specified.

ITEM 142 - ***** – CONCRETE PAVERS, TYPE 1**
ITEM 143 - ***** – CONCRETE PAVERS, TYPE 2**

Description: This work consists of furnishing and installing precast concrete pavers on a concrete slab with bituminous setting bed, neoprene tack coat, a prepared sub base and a prepared subgrade layer as shown on the plans or as directed by the Commissioner.

General:

Section includes:
1. Concrete Pavers
2. Joint Sand
3. Bitumen setting bed
4. Asphalt tack coat
5. 5" PCC Concrete base with 2" dia weep holes

References:

1. ASTM International, latest edition:
   - A. C 33, Standard Specification for Concrete Aggregates.
   - B. C 67, Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile, Section 8, Freezing and Thawing.
   - C. C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
   - D. C 140, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
   - E. C 144 Standard Specifications for Aggregate for Masonry Mortar.
   - F. D 448, Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
   - G. C 936, Standard Specification for Solid Concrete Interlocking Paving Units.
   - H. C 979, Standard Specification for Pigments for Integrally Colored Concrete.
   - I. D 698 Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 5.5 lb (24.4 N) Rammer and 12 in. (305 mm) drop.
   - J. D 977, Standard Specification for Emulsified Asphalt.
   - K. D 1557 Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 10-lb (44.5 N) Rammer and 18 in. (457 mm) drop.
   - L. C1645 Standard Test Method for Freeze-thaw and De-icing Salt Durability of Solid Concrete Interlocking Paving Units
   - M. D 1883, Test Method for California Bearing Ratio of Laboratory-Compacted Soils.
   - N. D 2940 Graded Aggregate Material for Bases or Subbases for Highways or Airports.
   - O. D 3381, Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.
   - P. D 4254, Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.

     Note: In order to determine the latest version of the listed specifications and standards, please consult the ASTM web page (www.astm.com)
   - Q. Illinois Department of Transportation:
     1. Standard Specifications for Road and Bridge Construction, January 2010, including all addenda.

Submittals:

1. Concrete Pavers
   A. Three representative full-size samples of each paver type, thickness, color and finish that indicate the range of color variation and texture expected upon project completion.
   B. Accepted samples become the standard of acceptance for the product produced.
   C. Test results from an independent testing laboratory for compliance of concrete pavers with ASTM C 936.
   D. Manufacturer's catalog product data, installation instructions, and material safety data sheets for the safe handling of the specified materials and products.
2. Joint Sand:
   A. Provide three representative one pound samples in containers of jointing sand that indicate the range of color variation and texture expected upon project completion.
   B. Accepted samples become the standard of acceptance for the product produced.
3. Neoprene modified asphalt adhesive product catalog sheets with specifications.
4. Bitumen Setting Bed: asphalt cement mix design to be used in the Bitumen Setting Bed conforming to ASTM D 3381.
5. Sieve analysis per ASTM C 136 for sand mixed with bitumen and sand for joints between concrete pavers.
6. Cast-in-Place Concrete slab per section ******** PORTLAND CEMENT CONCRETE SIDEWALK 8 INCH
7. Paving Installation Contractor:
   A. Job references from a minimum of three projects similar in size and complexity. Provide Owner/Client/General Contractor names, postal address, phone, fax, and email address.
8. Manuals:
   A. Provide 4 copies of manufacturer, maintenances and reinstatement manuals for Concrete Paver units.
9. Material Acceptance:
   A. The Contractor must provide a Manufacturer's written certification that the materials comply with these specifications.

Quality Assurance:

1. Utilize a Manufacturer having at least ten years of experience manufacturing interlocking concrete pavers on projects of similar nature or project size.
2. Source Limitations:
   A. Obtain Concrete Pavers from one source location with the resources to provide products of consistent quality in appearance and physical properties.
   B. Obtain joint sand from one source with the resources to provide materials and products of consistent quality in appearance and physical properties.
3. Paving Contractor Qualifications:
   A. Utilize an installer having successfully completed concrete paver installation similar in design, material, and extent indicated on the project.
4. Mockups:
   A. Install a 5 ft x 5 ft paver area per each paving type and pattern.
   B. Use this area to determine surcharge of the bedding aggregate layer, joint sizes, lines, laying pattern(s) and levelness.

C. This area will be used as the standard by which the work will be judged.
D. Subject to acceptance by owner, mock-up may be retained as part of finished work.
E. If mock-up is not retained, remove and properly dispose.

Delivery, Storage & Handling:

A. Deliver Concrete Pavers in manufacturer's original, unopened and undamaged container packaging with identification labels intact.
   1. Coordinate delivery and paving schedule to minimize interference with normal use of streets and sidewalks adjacent to paver installation.
   2. Deliver Concrete Pavers to the site in steel banded, plastic banded or plastic wrapped packaging capable of transfer by forklift or clamp lift.
   3. Unload Concrete Pavers at job site in such a manner that no damage occurs to the product or adjacent surfaces.
B. Store and protect materials free from mud, dirt and other foreign materials.
C. Prevent Joint from exposure to rainfall or removal by wind with secure, waterproof covering.

Project/Site Conditions:

A. Environmental Requirements:
   1. Install Concrete Pavers only on unfrozen Bitumen Setting Bed.
   2. Install the Neoprene Tack Coat only to unfrozen Bitumen Setting Bed or when the temperature is within the manufacturer's recommended temperature range.
   3. Install Bitumen Setting Bed materials only when the temperature is above freezing.
   4. Install Bitumen Setting Bed materials only when there is no heaving rain or snowfall.
   5. Install Setting Bed Sand or Concrete Pavers only when there is no heavy rain or snowfall.

Concrete Paver Overage And Attic Stock:

A. Provide a minimum of 5% additional material for overage to be used during construction.
B. Manufacturer to supply maintenance and reinstatement manuals for Concrete Paver units.

Products:

Concrete Pavers, Type 1

A. Basis-of-Design Product: The Concrete Paver shapes are based on:
Unilock: Il Campo 3 7/8 x 7 7/8 x 2 ¾ (100mm x 200mm x 70mm)

As manufactured by:
Unilock Chicago
301 E. Sullivan Rd.
Aurora, IL 60505
(630) 742-4168

Or Approved Equal. The specified products establish minimum requirements that substitutions must meet to be considered acceptable.
1. To obtain acceptance of unspecified products, submit written requests at least 7

days before the Bid Date.

B. Product requirements:
1. Concrete Paver:
a. Color: 50% Granite, 50% Granite Fusion
b. Finish: II Campo
d. Size: 3 7/8 x 7 7/8 x 2 ¾ (100mm x 200mm x 70mm)

C. Provide pavers meeting the minimum material and physical properties set forth in ASTM C 936, Standard Specification for Interlocking Concrete Paving Units. Efflorescence is not a cause for rejection.
1. Average compressive strength 8000 psi (55MPa) with no individual unit under 7,200 psi (50 MPa).
2. Average absorption of 5% with no unit greater than 7% when tested according to ASTM C 140.
3. Resistance to 50 freeze-thaw cycles, when tested according to ASTM C1645, with no breakage greater than 1.0% loss in dry weight of any individual unit. Conduct this test method not more than 12 months prior to delivery of units.

D. Accept only pigments in concrete pavers conforming to ASTM C 979. ACI Report No. 212.3R provides guidance on the use of pigments.

E. Maximum allowable breakage of product is 5%.

Concrete Pavers, Type 2

A. Basis-of-Design Product: The Concrete Paver shapes are based on:
Type A: Wausau Tile DB-2 Directional Paver

As manufactured by:
Wausau Tile
9001 Bus. Hwy 51
Rothschild, WI 54474
(800) 338-8728

Or Approved Equal. The specified products establish minimum requirements that substitutions must meet to be considered acceptable.
1. To obtain acceptance of unspecified products, submit written requests at least 7 days before the Bid Date.

B. Product requirements:

1. Concrete Paver Type A:
a. Color: A-90
b. Size: 12”x12”x 3” depth

C. Provide pavers meeting the minimum material and physical properties set forth in ASTM C 936, Standard Specification for Interlocking Concrete Paving Units. Efflorescence is not a cause for rejection.
1. Average compressive strength 8000 psi (55MPa) with no individual unit

under 7,200 psi (50 MPa).

2. Average absorption of 5% with no unit greater than 7% when tested according to ASTM C 140.
3. Resistance to 50 freeze-thaw cycles, when tested according to ASTM C1645, with no breakage greater than 1.0% loss in dry weight of any individual unit. Conduct this test method not more than 12 months prior to delivery of units.

D. Accept only pigments in concrete pavers conforming to ASTM C 979. ACI Report No. 212.3R provides guidance on the use of pigments.

F. Maximum allowable breakage of product is 5%.

Joint Sand

A. Provide polymeric Joint Sand as follows:
1. Color: Grey
2. Washed, clean, non-plastic, free from deleterious or foreign matter, symmetrically shaped, natural or manufactured from crushed rock.
3. Reject limestone screenings, stone dust, or sand for the Joint Sand material that does not conform to conform to the grading requirements of ASTM C 144.
4. Utilize sands that are as hard as practically available where Clay Brick Pavers are subject to vehicular traffic.
5. Gradation as shown in Table 1 below:

Table 1 – Gradation requirements for Joint Sand:

ASTM C 144		
Sieve Size	**Natural Sand Percent Passing**	**Manufactured Sand Percent Passing**
No. 4 (4.75 mm)	100	100
No. 8 (2.36 mm)	95 to 100	95 to 100
No. 16 (1.18 mm)	70 to 100	70 to 100
No. 30 (0.600 mm)	40 to 75	40 to 75
No. 50 (0.300 mm)	10 to 30	20 to 40
No. 100 (0.150 mm)	2 to 15	10 to 25
No. 200 (0.075)	0 to 1	0 to 10

Provide Polymeric Joint Sand as manufactured by:

1. Techniseal RG+
   a. Product Type: Dry mix, contains polymeric binding agent, activated with water.
   b. Color: Grey
2. Unicare HP Polymeric Max Sand
   a. Product Type: Dry mix, contains polymeric binding agent, activated with water.
   b. Color: Grey

Provide Polymeric Joint Sand meeting the minimum material and physical properties as follows:

1. Compression Strength: proven resistance to compression of 550 PSI after drying for 7 days under controlled conditions (73°F (23°C) at 50% humidity).
2. Test sand sample shape: cylinder (2" (5 cm) dia. X 4" (10 cm) high)

Neoprene Tack Coat

A. Neoprene modified asphalt adhesive:
   1. Karnak 230 2% neo-asphalt paving block adhesive.
      Note: Only apply enough Neoprene Tack Coat to completely cover the Bitumen Setting Bed. Applying an excessive amount of Neoprene Tack Coat can cause the material to expand during summer months and ooze up through the paver joint damaging the paver surface.

Bitumen Setting Bed Materials

A. Sand for asphalt bed:
   1. Clean, non-plastic, free from deleterious or foreign matter, symmetrically shaped, natural or manufactured from crushed rock.
   2. Graded according to ASTM C 136.
   3. Bedding Sand Material Requirements: Conform to the grading requirements of ASTM C 33 with modifications as shown in Table 2.

Table 2 – Gradation Requirements For Bitumen Setting Bed

ASTM C 33	
Sieve Size	**Percent Passing**
No. 4 (4.75 mm)	100
No. 8 (2.36 mm)	85 to 100
No. 16 (1.18 mm)	50 to 85
No. 30 (0.600 mm)	25 to 60
No. 50 (0.300 mm)	10 to 30
No. 100 (0.150 mm)	2 to 10
No. 200 (0.075)	2 to 10

B. Asphalt Cement:
   1. Provide Asphalt Cement used in the bituminous setting bed conforming to ASTM D 946 with a penetration at 77 degrees F. 100G., 5 sec of minimum 85 millimeters and a maximum of 100 millimeters.
   2. Combine the dried fine aggregate with hot asphalt cement, and heat the mix to approximately 300 degrees Fahrenheit (150□ C), at an asphalt plant. Mix the approximated proportion of materials including 7% asphalt cement and 93% fine aggregate. Proportioned by weight each ton of the batch in the approximate ratio of 145 lbs (66 kg) asphalt to 1,855 lbs (840 kg) sand.

C. Primer for base:
   1. Anionic asphalt emulsion SS-1h, per ASTM D 977.

Edge Restraints
A. Edge restraints are indicated on drawings and identified as:
   1. Flush Concrete Curb
   2. PCC Sidewalk with thickened edge
   3. Concrete Structures (at Precast Bench locations)

Execution

Examination
A. Examine areas indicated to receive paving for compliance with requirements for installation tolerances and other conditions affecting performance for the following items before placing the Concrete Pavers.
   1. Verify that Cast-in-Place Concrete Underlayment strength, thickness, surface tolerances and elevations conform to specified requirements.
   2. Verify that the Bitumen Setting Bed materials, thickness, compacted density, surface tolerances and elevations conform to specified requirements.
   3. Verify location, type, and elevations of edge restraints, concrete curbing, concrete collars around utility structures, and drainage inlets.
   4. Verify location of 2 in. (50 mm) diameter weep holes at 100sf on center and at lowest elevations against curbs, walls, or other permanent structures or as indicated on the drawings. Verify holes filled with IDOT CA-16. Provide temporary plugs for holes to prevent ingress of sand-asphalt setting bed or neoprene adhesive during construction. Remove plugs when paving adjacent to drain holes.
   5. Verify that concrete surfaces to receive the bitumen bedding material are free of dust, oil, grease, paint, wax, curing compounds, primer, sealers, form release agents, from cracks over 3/16 in. (5 mm) in width, or any deleterious substances and debris which may prevent or reduce bonding.
   6. Conduct moisture tests to verify that concrete surfaces are cured, free from hydrostatic pressure and having a moisture content of less than 5%.
   7. Verify location, type, and elevations of edge restraints, [concrete collars around] utility structures, and drainage inlets.
   8. Do not proceed with installation of Bitumen Setting Bed or Concrete Pavers until base conditions are corrected by the General Contractor or designated subcontractor.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
   1. Beginning of Bitumen Setting Bed and Concrete Paver installation signifies acceptance of Cast-in-Place Concrete Underlayment.

Preparation
A. Verify that Cast-in-Place Concrete Underlayment is clean, dry, and ready to accept Primer, Bitumen Setting Bed, Tack Coat, Concrete Pavers, and imposed loads.
B. Stockpile Joint Sand materials such that they are free from standing water, uniformly graded, free of any organic material or sediment, debris, and ready for placement.
C. Remove any excess thickness of soil applied over the excavated soil subgrade to trap sediment from adjacent construction activities before placing the Aggregate Base.
D. Keep area where pavement is to be constructed free from sediment during entire job.

Remove and replace all Joint Sand contaminated with sediment with clean materials.

E. Complete all subdrainage of underground services within the pavement area in conjunction with subgrade preparation and before the commencement of Cast-in-Place Concrete Underlayment construction.

F. Prevent damage to underdrain pipes, overflow pipes, observation wells, or inlets and other drainage appurtenances during installation. Report all damage immediately.

G. Compact soil subgrade uniformly to at least 95 percent of Standard Proctor Density per ASTM D 698 for pedestrian areas. Compact soil subgrade uniformly to at least 98 percent Modified Proctor per ASTM D 1557 for vehicular areas. Stabilization of the subgrade may be necessary with weak or saturated subgrade soils.

H. Backfill all service trenches within the pavement area to the subgrade level with approved material placed in uniform lifts not exceeding 4 in. (100 mm) loose thickness. Compact each lift to at least 100 percent Standard Proctor Density as specified in ASTM D 698.

I. Trim the subgrade to within 0 to 1/2 inch (0 to 13mm) of the specified grades. Do not deviate the surface of the prepared subgrade by more than 3/8 inch (10mm) from the bottom edge of a 39 inches (1m) straight edge laid in any direction.

J. Do not proceed with further pavement construction, under any circumstances, until the subgrade has been inspected by the Commissioner.

Note: Base compaction of the subgrade soil on the recommendations of the Commissioner. Request the Commissioner to inspect subgrade preparations, elevations and conduct density tests for conformance to specifications.

Installation

A. Concrete base preparation:
   1. Fill any cracks under 3/16 in. (5 mm) wide with mortar.
   2. Sweep the surface clean.

B. ASPHALT PRIMER:
   1. Apply Bitumen Setting Bed Asphalt primer to Cast-in-Place Concrete Underlayment to bond the bituminous bedding material to the concrete base.
   2. Apply according to manufacturer's recommendation

   Note: Utilize Cut Back Asphalt Specification (Rapid Curing Type), per ASTM D 2028-97 (2004) and AASHTO M-81.

C. BITUMEN SETTING BED:
   1. Place in panels between 3/4 inch (20 mm) high screed rails spaced approximately 12 ft (4 m). Set the depth screed rails carefully to bring the Bitumen Bedding material to proper grade, to insure proper Concrete Paver finished height. Place Bitumen Bedding material between the parallel screed rails. Rake and screed smooth with strike board. Fill any depressions with fresh bituminous material to produce a smooth, firm and even setting bed after each pass.
   2. Use screed rails to achieve a level setting bed conforming to elevations and slope shown on the drawings. After one panel is completed, advance screed rails to the next position in readiness for screeding adjacent panels with strike board. Fill depressions left from removed screed rails and smooth to height consistent with panel.
   3. Place an area in size that will remain at least 270° F (130° C) during compaction.
   4. Compact the Bitumen Setting Bed with a powered roller compactor to an even, nominal thickness of 3/4 inch (20 mm) after compaction while still hot. Adjusted the Bitumen Setting Bed to accommodate the required finished grade of the

Concrete Pavers. Proper attention to elevations during the construction of the concrete base material will insure maintaining the required nominal 3/4 inch thick Bitumen Setting Bed.

5. Re-heat, fill, and compact low areas with Bitumen Setting Bed materials to conform to slope and elevation shown on the drawings.
6. Re-heat, remove, level, and compact Bitumen Setting Bed in high areas to conform to slope and elevation shown on the drawings.
7. Correct irregularities or evenness in the grade of the concrete base surface with Setting Bed materials only.

D. NEOPRENE MODIFIED ASPHALT ADHESIVE:

1. Apply to cold asphalt setting bed with notched trowel with serrations not exceeding 1/16 inch (2 mm). Do not apply pavers to adhesive until dry skin forms on surface of adhesive, approximately 2-3 hours depending on air temperature.

E. EDGE RESTRAINTS:

1. Provide concrete edge restraints as indicated on drawings
   b. Install the face of the concrete edge restraint, where it abuts pavers vertical down to the subbase.
   c. Construct concrete edge restraint to dimensions and level specified and support on a compacted subbase not less than 6 in (150 mm) thick.

F. CONCRETE PAVERS

1. Replace Concrete Pavers with chips, cracks, voids, discolorations, and other defects that might be visible in finished work.
2. Mix Concrete Pavers from a minimum of three (3) bundles simultaneously drawing the paver vertically rather than horizontally, as they are placed, to produce uniform blend of colors and textures. (Color variation occurs with all concrete products. This phenomenon is influenced by a variety of factors, e.g. moisture content, curing conditions, different aggregates and, most commonly, from different production runs. By installing from a minimum of three (3) bundles simultaneously, variation in color is dispersed and blended throughout the project).
3. Exercise care in handling face mix concrete pavers to prevent surfaces from contacting backs or edges of other units.
4. Place Concrete Pavers using laying pattern as indicated. Adjust laying pattern at pavement edges such that cutting of edge pavers is minimized. Cut all pavers exposed to vehicular tires no smaller than one-third of a whole paver.
5. Use string lines or chalk lines on Setting Bed Sand to hold all pattern lines true.
6. Set surface elevation of pavers 1/8 in. (3 mm) above adjacent drainage inlets, concrete collars or channels.
7. Place units hand tight against spacer bars. Adjust horizontal placement of laid pavers to align straight.
   a. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.
8. Provide space between paver units of 1/32 in. (1 mm) wide to achieve straight bond lines.
9. Prevent (bond) lines from shifting more than ±1/2 in. (±13 mm) over 50 ft. (15 m) from string lines.
10. Fill gaps between units or at edges of the paved area that exceed 3/8 inch (10 mm) with pieces cut to fit from full-size unit pavers.
11. Cut Concrete Pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit

adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.

12. Prevent all traffic on installed Concrete Pavers until Joint Sand has been vibrated into joints. Keep skid steer and forklift equipment off newly laid Concrete Pavers that have not received initial compaction and Joint Sand material.
13. Vibrate Concrete Pavers into leveling course with a low-amplitude plate vibrator capable of a to 5000-lbf (22-kN) compaction force at 80 to 90 Hz. Perform at least three passes across paving with vibrator. Vibrate under the following conditions:
    a. After edge pavers are installed and there is a completed surface or before surface is exposed to rain.
    b. Compact installed Concrete Pavers to within 6 feet (2 meters) of the laying face before ending each day's work. Cover Concrete Pavers that have not been compacted and leveling course on which pavers have not been placed, with nonstaining plastic sheets to prevent Setting Bed Sand from becoming disturbed.
14. Protect face mix Concrete Paver surface from scuffing during compaction by utilizing a urethane pad.
15. Remove any cracked or structurally damaged Concrete Pavers and replace with new units prior to installing Joint Sand material.

G. JOINT SAND
1. Provide, spread and sweep dry Joint Sand into joints immediately after vibrating pavers into Tack Coat and Bitumen Setting Bed course until full. Vibrate pavers and add Joint Sand material until joints are completely filled, then remove excess material. This will require at least 4 passes with a plate compactor.
2. Leave all work to within 3 ft. (1 m) of the laying face fully compacted with sand filled joints at the completion of each day.
3. Remove excess Joint Sand broom clean from surface when installation is complete.

Field Quality Control

A. Verify final elevations for conformance to the drawings after sweeping the surface clean.
1. Prevent final Concrete Paver finished grade elevations from deviating more than ±3/8 in. (±10 mm) under a 10 ft (3 m) straightedge or indicated slope, for finished surface of paving.

B. Lippage: No greater than 1/32 in. (0.8 mm) difference in height between Concrete Pavers and adjacent paved surfaces.

Repairing and Cleaning

A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.

B. Cleaning: Remove excess dirt, debris, stains, grit, etc. from exposed paver surfaces; wash and scrub clean.
1. Clean Concrete Pavers in accordance with the manufacturer's written recommendations.

Protection

A. Protect completed work from damage due to subsequent construction activity on the site.

Method of Measurement: This work will be measured in place and the area computed in square foot for CONCRETE PAVERS TYPE 1 and CONCRETE PAVERS TYPE 2.

Basis of Payment: This work will be paid for at the contract unit price per square foot for CONCRETE PAVERS TYPE 1 and CONCRETE PAVERS TYPE 2, which shall include all the material, labor, equipment, and all incidental work necessary to perform the work described above.

ITEM 144 - ******* – CLAY BRICK PAVERS

Description: This work consists of furnishing and installing clay brick pavers on a concrete slab with bituminous setting bed, neoprene tack coat, a prepared sub base and a prepared subgrade layer as shown on the plans or as directed by the Commissioner.

General:

Section includes:
1. Clay Brick Pavers
2. Joint Sand
3. Bitumen setting bed
4. Asphalt tack coat
5. 5" PCC Concrete base

References:
1. ASTM International, latest edition:
   - A. C 33, Standard Specification for Concrete Aggregates
   - B. C 67, Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile, Section 8, Freezing and Thawing.
   - C. C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
   - D. C 144 Standard Specifications for Aggregate for Masonry Mortar.
   - E. D 448, Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
   - F. D 698 Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 5.5 lb (24.4 N) Rammer and 12 in. (305 mm) drop
   - G. C 902, Standard Specification for Pedestrian and Light Traffic Paving Brick.
   - H. D 977, Standard Specification for Emulsified Asphalt.
   - I. D 1557 Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 10-lb (44.5 N) Rammer and 18 in. (457 mm) drop.
   - J. D 1883, Test Method for California Bearing Ratio of Laboratory-Compacted Soils.
   - K. D 2940 Graded Aggregate Material for Bases or Subbases for Highways or Airports.
   - L. D 3381, Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.
   - M. D 4254, Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.

Note: In order to determine the latest version of the listed specifications and standards, please consult the ASTM web page (www.astm.com)

Illinois Department of Transportation:

1. Standard Specifications for Road and Bridge Construction, January 2010, including all addenda.

Submittals:

10. Clay Brick Pavers
    A. Three representative full-size samples of each paver type, thickness, color and finish that indicate the range of color variation and texture expected upon project completion.
    B. Accepted samples become the standard of acceptance for the product produced.
    C. Test results for each type of clay brick paving shall be submitted to the commissioner for approval. Testing reports must be from an independent testing laboratory for compliance with ASTM C 902 and in accordance with ASTM C 67.Test reports shall indicate:
        i. Compressive strength.
        ii. 24 hour cold water absorption.
        iii. 5-hour boil absorption.
        iv. Saturation coefficient.
        v. Initial rate of absorption.
        vi. Efflorescence.
    D. Manufacturer's catalog product data, installation instructions, and material safety data sheets for the safe handling of the specified materials and products.
11. Joint Sand:
    A. Provide three representative one pound samples in containers of jointing sand that indicate the range of color variation and texture expected upon project completion.
    B. Accepted samples become the standard of acceptance for the product produced.
12. Neoprene modified asphalt adhesive product catalog sheets with specifications.
13. Bitumen Setting Bed: asphalt cement mix design to be used in the Bitumen Setting Bed conforming to ASTM D 3381.
14. Sieve analysis per ASTM C 136 for sand mixed with bitumen and sand for joints between Clay Brick Pavers.
15. Cast-in-Place Concrete slab per section CDOT4240010 PORTLAND CEMENT CONCRETE SIDEWALK 5 INCH
16. Paving Installation Contractor:
    A. Job references from a minimum of three projects similar in size and complexity. Provide Owner/Client/General Contractor names, postal address, phone, fax, and email address.
17. Manuals:
    A. Provide 4 copies of manufacturer, maintenances and reinstatement manuals for Brick Paver units.
18. Material Acceptance:
    A. The Contractor must provide a Manufacturer's written certification that the materials comply with these specifications.

Quality Assurance:

5. Utilize a Manufacturer having at least five years of experience manufacturing clay brick pavers on projects of similar nature or project size.
6. Source Limitations:
   A. Obtain Brick Pavers from one source location with the resources to provide products of consistent quality in appearance and physical properties.
   B. Obtain joint sand from one source with the resources to provide materials and products of consistent quality in appearance and physical properties.
7. Paving Contractor Qualifications:
   A. Utilize an installer having successfully completed clay brick paver installations similar in design, material, and extent indicated on the project. Installer must have a minimum of 2 years of experience.
8. Mockups:
   A. Install a 5 ft x 5 ft paver area per each paving type and pattern.
   B. Use this area to determine surcharge of the bedding aggregate layer, joint sizes, lines, laying pattern(s) and levelness.
   C. This area will be used as the standard by which the work will be judged.
   D. Subject to acceptance by owner, mock-up may be retained as part of finished work.
   E. If mock-up is not retained, remove and properly dispose.

Delivery, Storage & Handling:

A. Deliver Clay Brick Pavers in manufacturer's original, unopened and undamaged container packaging with identification labels intact.
   1. Coordinate delivery and paving schedule to minimize interference with normal use of streets and sidewalks adjacent to paver installation.
   2. Deliver Clay Brick Pavers to the site in steel banded, plastic banded or plastic wrapped packaging capable of transfer by forklift or clamp lift.
   3. Unload Clay Brick Pavers at job site in such a manner that no damage occurs to the product or adjacent surfaces.

B. Store and protect materials free from mud, dirt and other foreign materials.

C. Prevent Joint from exposure to rainfall or removal by wind with secure, waterproof covering.

Project/Site Conditions:

A. Environmental Requirements:
   1. Install Clay Brick Pavers only on unfrozen Bitumen Setting Bed.
   2. Install the Neoprene Tack Coat only to unfrozen Bitumen Setting Bed or when the temperature is within the manufacturer's recommended temperature range.
   3. Install Bitumen Setting Bed materials only when the temperature is above freezing.
   4. Install Bitumen Setting Bed materials only when there is no heaving rain or snowfall.
   5. Install Setting Bed or Clay Brick Pavers only when there is no heavy rain or snowfall.

Clay Brick Paver Overage And Attic Stock:

A. Provide a minimum of 5% additional material for overage to be used during construction.

Products:

Clay Brick Pavers

A. Basis-of-Design Product: The Clay Brick Paver shapes and colors are based on: Belden Regimental Full Range (or similar)

As manufactured by:
Belden Brick Company

Or Approved Equal. The specified products establish minimum requirements that substitutions must meet to be considered acceptable.

1. To obtain acceptance of unspecified products, submit written requests at least 7 days before the Bid Date.

B. Product requirements:

1. Clay Brick Paver
   a. Color: Regimental Full Range (or similar)
   b. Texture: Wire Cut
   c. Edge: Beveled
   d. Size: 4”x8”x 2.25” depth
   e. Type: Extruded
   f. Grade: Exterior

Joint Sand

A. Provide polymeric Joint Sand as follows:

1. Color: Black
2. Washed, clean, non-plastic, free from deleterious or foreign matter, symmetrically shaped, natural or manufactured from crushed rock.
3. Reject limestone screenings, stone dust, or sand for the Joint Sand material that does not conform to conform to the grading requirements of ASTM C 144.
4. Utilize sands that are as hard as practically available where Clay Brick Pavers are subject to vehicular traffic.
5. Gradation as shown in Table 1 below:

Table 1 – Gradation requirements for Joint Sand:

ASTM C 144		
Sieve Size	**Natural Sand Percent Passing**	**Manufactured Sand Percent Passing**
No. 4 (4.75 mm)	100	100
No. 8 (2.36 mm)	95 to 100	95 to 100
No. 16 (1.18 mm)	70 to 100	70 to 100
No. 30 (0.600 mm)	40 to 75	40 to 75
No. 50 (0.300 mm)	10 to 30	20 to 40
No. 100 (0.150 mm)	2 to 15	10 to 25

No. 200 (0.075)	0 to 1	0 to 10

Provide Polymeric Joint Sand as manufactured by:

1. Techniseal RG+
   a. Product Type: Dry mix, contains polymeric binding agent, activated with water.
   b. Color: Black
2. Unicare HP Polymeric Max Sand
   a. Product Type: Dry mix, contains polymeric binding agent, activated with water.
   b. Color:Black

Provide Polymeric Joint Sand meeting the minimum material and physical properties as follows:

1. Compression Strength: proven resistance to compression of 550 PSI after drying for 7 days under controlled conditions (73°F (23°C) at 50% humidity).
2. Test sand sample shape: cylinder (2" (5 cm) dia. X 4" (10 cm) high)

Neoprene Tack Coat

A. Neoprene modified asphalt adhesive:
   1. Karnak 230 2% neo-asphalt paving block adhesive.
      Note: Only apply enough Neoprene Tack Coat to completely cover the Bitumen Setting Bed. Applying an excessive amount of Neoprene Tack Coat can cause the material to expand during summer months and ooze up through the paver joint damaging the paver surface.

Bitumen Setting Bed Materials

A. Sand for asphalt bed:
   1. Clean, non-plastic, free from deleterious or foreign matter, symmetrically shaped, natural or manufactured from crushed rock.
   2. Graded according to ASTM C 136.
   3. Bedding Sand Material Requirements: Conform to the grading requirements of ASTM C 33

B. Asphalt Cement:
   1. Provide Asphalt Cement used in the bituminous setting bed conforming to ASTM D 946 with a penetration at 77 degrees F. 100G., 5 sec of minimum 85 millimeters and a maximum of 100 millimeters.
   2. Combine the dried fine aggregate with hot asphalt cement, and heat the mix to approximately 300 degrees Fahrenheit (150□ C), at an asphalt plant. Mix the approximated proportion of materials including 7% asphalt cement and 93% fine aggregate. Proportioned by weight each ton of the batch in the approximate ratio of 145 lbs (66 kg) asphalt to 1,855 lbs (840 kg) sand.

C. Primer for base:
   1. Anionic asphalt emulsion SS-1h, per ASTM D 977.

Edge Restraints

A. Edge restraints are indicated on drawings and identified as:
   1. Concrete Curb
   2. PCC Sidewalk with thickened edge

B. All paver fields must use concrete edge restraints as indicated on plans and details. No other types of edge restraints will be allowed.

Execution

Examination

A. Examine areas indicated to receive clay brick paving for compliance with requirements for installation tolerances and other conditions affecting performance for the following items before proceeding.
   1. Verify that Cast-in-Place Concrete Underlayment strength, thickness, surface tolerances and elevations conform to specified requirements.
   2. Verify that the Bitumen Setting Bed materials, thickness, compacted density, surface tolerances and elevations conform to specified requirements.
   3. Verify location, type, and elevations of edge restraints, concrete curbing, concrete collars around utility structures, and drainage inlets.
   4. Verify that concrete surfaces to receive the bitumen bedding material are free of dust, oil, grease, paint, wax, curing compounds, primer, sealers, form release agents, from cracks over 3/16 in. (5 mm) in width, or any deleterious substances and debris which may prevent or reduce bonding.
   5. Conduct moisture tests to verify that concrete surfaces are cured, free from hydrostatic pressure and having a moisture content of less than 5%.
   6. Verify location, type, and elevations of edge restraints, concrete collars around utility structures, and drainage inlets.
   7. Do not proceed with installation of Bitumen Setting Bed or Clay Brick Pavers until base conditions are corrected by the General Contractor or designated subcontractor.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
   1. Beginning of Bitumen Setting Bed and Clay Brick Paver installation signifies acceptance of Cast-in-Place Concrete Underlayment.

Preparation

A. Verify that Cast-in-Place Concrete Underlayment is clean, dry, and ready to accept Primer, Bitumen Setting Bed, Tack Coat, Clay Brick Pavers, and imposed loads.

B. Stockpile Joint Sand materials such that they are free from standing water, uniformly graded, free of any organic material or sediment, debris, and ready for placement.

C. Remove any excess thickness of soil applied over the excavated soil subgrade to trap sediment from adjacent construction activities before placing the Aggregate Base.

D. Keep area where pavement is to be constructed free from sediment during entire job. Remove and replace all Joint Sand contaminated with sediment with clean materials.

E. Complete all subdrainage of underground services within the pavement area in conjunction with subgrade preparation and before the commencement of Cast-in-Place Concrete Underlayment construction.

F. Prevent damage to underdrain pipes, overflow pipes, observation wells, or inlets and other drainage appurtenances during installation. Report all damage immediately.

G. Compact soil subgrade uniformly to at least 95 percent of Standard Proctor Density per ASTM D 698 for pedestrian areas. Compact soil subgrade uniformly to at least 98 percent Modified Proctor per ASTM D 1557 for vehicular areas. Stabilization of the subgrade may be necessary with weak or saturated subgrade soils.

H. Backfill all service trenches within the pavement area to the subgrade level with approved

material placed in uniform lifts not exceeding 4 in. (100 mm) loose thickness. Compact each lift to at least 100 percent Standard Proctor Density as specified in ASTM D 698.

I. Trim the subgrade to within 0 to 1/2 inch (0 to 13mm) of the specified grades. Do not deviate the surface of the prepared subgrade by more than 3/8 inch (10mm) from the bottom edge of a 39 inches (1m) straight edge laid in any direction.

J. Do not proceed with further pavement construction, under any circumstances, until the subgrade has been inspected by the Commissioner.

Note: Base compaction of the subgrade soil on the recommendations of the Commissioner. Request the Commissioner to inspect subgrade preparations, elevations and conduct density tests for conformance to specifications.

Installation

A. Concrete base preparation:
   1. Fill any cracks under 3/16 in. (5 mm) wide with mortar.
   2. Sweep the surface clean.

B. ASPHALT PRIMER:
   1. Apply Bitumen Setting Bed Asphalt primer to Cast-in-Place Concrete Underlayment to bond the bituminous bedding material to the concrete base.
   2. Apply according to manufacturer's recommendation

   Note: Utilize Cut Back Asphalt Specification (Rapid Curing Type), per ASTM D 2028-97 (2004) and AASHTO M-81.

C. BITUMEN SETTING BED:
   1. Place in panels between 3/4 inch (20 mm) high screed rails spaced approximately 12 ft (4 m). Set the depth screed rails carefully to bring the Bitumen Bedding material to proper grade, to insure proper Clay Brick Paver finished height. Place Bitumen Bedding material between the parallel screed rails. Rake and screed smooth with strike board. Fill any depressions with fresh bituminous material to produce a smooth, firm and even setting bed after each pass.
   2. Use screed rails to achieve a level setting bed conforming to elevations and slope shown on the drawings. After one panel is completed, advance screed rails to the next position in readiness for screeding adjacent panels with strike board. Fill depressions left from removed screed rails and smooth to height consistent with panel.
   3. Place an area in size that will remain at least 270° F (130° C) during compaction.
   4. Compact the Bitumen Setting Bed with a powered roller compactor to an even, nominal thickness matching dimensions shown on details after compaction while still hot. Adjusted the Bitumen Setting Bed to accommodate the required finished grade of the Clay Brick Pavers. Proper attention to elevations during the construction of the concrete base material will insure maintaining the required nominal thickness Bitumen Setting Bed.
   5. Re-heat, fill, and compact low areas with Bitumen Setting Bed materials to conform to slope and elevation shown on the drawings.
   6. Re-heat, remove, level, and compact Bitumen Setting Bed in high areas to conform to slope and elevation shown on the drawings.
   7. Correct irregularities or evenness in the grade of the concrete base surface with Setting Bed materials only.

D. NEOPRENE MODIFIED ASPHALT ADHESIVE:
   1. Apply to cold asphalt setting bed with notched trowel with serrations not exceeding 1/16 inch (2 mm). Do not apply clay brick pavers to adhesive until dry skin forms on surface of adhesive, approximately 2-3 hours depending on air

temperature.

E. EDGE RESTRAINTS:

1. Provide concrete edge restraints as indicated on drawings
   b. Install the face of the concrete edge restraint, where it abuts pavers vertical down to the subbase.
   c. Construct concrete edge restraint to dimensions and level specified and support on a compacted subbase not less than 6 in (150 mm) thick.

E. CLAY BRICK PAVERS

1. Do not use any Clay Brick Pavers with chips, cracks, voids, discolorations, and other defects that might be visible in finished work.
2. Mix Clay Brick Pavers from a minimum of three (3) bundles simultaneously drawing the paver vertically rather than horizontally, as they are placed, to produce uniform blend of colors and textures.
4. Place Clay Brick Pavers using laying pattern as indicated. Adjust laying pattern at pavement edges such that cutting of edge pavers is minimized. Cut all pavers no smaller than one-half of a whole paver.
5. Use string lines or chalk lines to hold all pattern lines true.
6. Set surface elevation of pavers 1/8 in. (3 mm) above adjacent drainage inlets, concrete collars or channels.
7. Place units hand tight against spacer bars. Adjust horizontal placement of laid pavers to align straight.
   a. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.
8. Provide 1/16 inch to 3/16 inch (2 to 5 mm) wide joints between pavers.
   Joint width spacing is critical to establishing interlock and minimizing paver chipping. 1/8" joint is optimal. Pavers with insufficient joint spacing are subject to chipping during installation or service.
9. Adjust pavers to form straight bond lines and appropriate joint widths. Maximum bond line variation shall be ±1/4 inch~~.~~ over 10 feet~~.~~ as measured from string lines.
10. Cut pavers only as indicted on drawings.
11. Paver cuts must be made with double blade paver splitter or wet cut masonry saw or vacuum saw. Cut pavers shall be no smaller than one-third of whole paver except as indicated on drawings to maintain pattern.
12. Prevent all traffic on installed Clay Brick Pavers until Joint Sand has been vibrated into joints. Keep skid steer and forklift equipment off newly laid Clay Brick Pavers that have not received initial compaction and Joint Sand material.
13. Vibrate Clay Brick Pavers with a low-amplitude plate vibrator capable of a to 5000-lbf (22-kN) compaction force at 80 to 90 Hz. Perform at least three passes across paving with vibrator. Vibrate under the following conditions:
    a. After edge pavers are installed and there is a completed surface or before surface is exposed to rain.
    b. Compact installed Clay Brick Pavers to within 6 feet (2 meters) of the laying face before ending each day's work. Cover Clay Brick Pavers that have not been compacted and base course on which pavers have not been placed, with nonstaining plastic sheets to prevent disturbance.
14. Protect Clay Brick Paver surface from scuffing or chipping during compaction by utilizing a urethane or rubber matt, rubber rollers or other approved material.
15. Remove any cracked or structurally damaged Clay Brick Pavers and replace with new units prior to installing Joint Sand material.

F. JOINT SAND
1. Provide, spread and sweep dry Joint Sand into joints immediately after vibrating pavers into Tack Coat and Bitumen Setting Bed course until full. Vibrate pavers and add Joint Sand material until joints are completely filled, then remove excess material. This will require at least 4 passes with a plate compactor.
2. Leave all work to within 3 ft. (1 m) of the laying face fully compacted with sand filled joints at the completion of each day.
3. Remove excess Joint Sand broom clean from surface when installation is complete.

Field Quality Control
A. Verify final elevations for conformance to the drawings after sweeping the surface clean.
1. Prevent final Clay Brick Paver finished grade elevations from deviating more than ±3/8 inch. (10 mm) under a 10 ft (3 m) straightedge from specified elevations.
2. Clay Brick Paver elevation shall be flush with adjacent construction.

B. Lippage: The maximum height difference between adjacent pavers or adjacent construction shall not exceed 1/16 inch.

Repairing and Cleaning
A. Remove and replace any unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.
B. Cleaning: Remove excess dirt, debris, stains, grit, etc. from exposed paver surfaces; wash and scrub clean.
1. Clean Clay Brick Pavers in accordance with the manufacturer's written recommendations.

Protection
A. Protect completed work from damage due to subsequent construction activity on the site.

Method of Measurement: This work will be measured in place and the area computed in square foot for CLAY BRICK PAVERS.

Basis of Payment: This work will be paid for at the contract unit price per square foot for CLAY BRICK PAVERS, which shall include all the material, labor, equipment, and all incidental work necessary to perform the work described above.

ITEM 145 - ***** – CONCRETE PAVERS, TYPE 1 (FURNISH ONLY)**
ITEM 146 - ***** – CONCRETE PAVERS, TYPE 2 (FURNISH ONLY)**
ITEM 147 - ****** - CLAY BRICK PAVERS (FURNISH ONLY)**

Description: This work shall include furnishing pavers to the City to be stored by the City for future repairs to installed paver areas.

General Requirements: All pavers shall be whole and undamaged. Each paver type included in the plans shall be stacked/boxed together placed on a pallet and shrink wrapped for transport/storage. Each paver bundle shall be labeled (color, size, date palatized) both inside shrink wrap and out. Each paver type quantity shall be 20% of the total project quantity or 200 square feet, whichever is less.

Contractor shall allow inspection by Commissioner of pavers prior to shrink wrapping. Once inspected and palatized for transport, the Contractor shall store pavers on-site in a dry area. After substantial completion of the paver work, the Contractor will transport the palatized pavers of each type to a location directed by the Commissioner.

Method of Measurement: This work will be measured in place and the area computed in square foot for CONCRETE PAVERS, TYPE 1 (FURNISH ONLY), CONCRETE PAVERS, TYPE 2 (FURNISH ONLY), CLAY BRICK PAVERS (FURNISH ONLY).

Basis of Payment: This work will be paid for at the contract unit price per square foot for CONCRETE PAVERS, TYPE 1 (FURNISH ONLY), CONCRETE PAVERS, TYPE 2 (FURNISH ONLY), CLAY BRICK PAVERS (FURNISH ONLY), which shall include all the material, labor, equipment, and all incidental work necessary to perform the work described above.

ITEM 148 - ****** - BENCH, 6FT, TYPE 1**
ITEM 149 - ****** - BENCH, 6FT, TYPE 2**

Description: This work must consist of furnishing and installing benches with anchoring hardware at the locations specified in the Contract plans or as directed by the Commissioner.

General Requirements: Each bench will be placed at the location indicated in the plans. The locations will be field marked and verified for approval by the Commissioner.

ASSEMBLY
Anchor bolts must be located with assembled bench in place. Benches must be mounted as detailed in the plans. Anchor bolts must be drilled and grouted into the concrete base for pavers, concrete wearing surface or concrete sidewalk.

MATERIALS
Bench types are as follows:

BENCH TYPE 1

BENCH TYPE 1 should be similar to the Victor Stanley Model "Ribbon Series RB-28" as approved by the Commissioner.

Materials must be as specified in the plans and must be "Gloss Black" in color.

FINISH: Finish must be powder coating or similar coating process.
MOUNTING: Surface mounted (contractor shall supply stainless steel anchoring hardware)

Standard 6 Foot Length with Center Armrest by the following suggested manufacturers:

Victor Stanley, Inc.,
Wausau Tile, Inc.
Trystan, Inc.

BENCH TYPE 2

BENCH TYPE 2 should be similar to the Landscape Forms, Inc. model "Plainwell" as approved by the Commissioner.

Materials must be as follows:

STYLE: Backed
SIZE: 73 1/4 inches long
MOUNTING: Surface mounted (contractor shall supply stainless steel anchoring hardware)
OPTIONS: No center arm
ALUMINUM: ASTM B221 extruded aluminum boards have end caps. Aluminum boards and end caps are clear anodized (202-R1) and powder coated to match the frame color.

FRAME: End supports with integral armrests are sand cast aluminum. Seat straps, back straps, and center straps are sand-cast aluminum. Leg section is 1-1/2" x 2" oval shape. End supports are connected by two A36 steel channels 1-1/2" x 9/16" x 3/16" fastened with black Magni-coated steel cap screws.

FINISH ON METAL: Landscape Forms, Inc. "Pangard II".

1. Primer: Rust inhibitor
2. Topcoat: Thermosetting TGIC polyester powder coat. UV, chip, and flake resistant.
3. Test Results: "Pangard II".
   a. Gloss Consistency, Gardner 60 Degrees, ASTM D 523: Plus or minus 5 percent from standard.
   b. UV Resistance, Color and Gloss, ASTM G 155, Cycle 7: Delta E less than 2 at 2.0 mils and less than 20 percent loss.
   c. Cross-Hatch Adhesion, ASTM D 3359, Method B: 100 percent pass.
   d. Flexibility Test, Mandrel, ASTM D 522: 3 mm at 2 mils.
   e. Erichsen Cupping, ISO 1520: 8 mm.
   f. Impression Hardness, Buchholz, ISO 2815: 95.
   g. Impact Test, ASTM D 2794: 60 inch-pounds at 2.5 mils.
   h. Pencil Hardness, ASTM D 3363: 2H minimum.
   i. Corrosion Resistance, 1,500-Hour Test, ASTM B 117: Max. undercutting 1 mm.
   j. Humidity Resistance, 1,500-Hour Test, ASTM D 2247: Max. blisters 1 mm.
4. Color: Gloss Black

Bench manufactured by:
Landscape Forms, Inc., 7800 E. Michigan Ave, Kalamazoo, Michigan 49048. Phone: (800) 521-2546. Fax (269) 381-3455. Website www.landscapeforms.com E-mail: specify@landscapeforms.com

Submittals: Submit manufacturer's technical data for each manufactured product, including certification that each product complies with the specified requirements. In accordance with the Standard Specifications, the Contractor must submit shop drawings for the Commissioner's approval showing the bench completely assembled including shop drawings of its component parts.

Method of Measurement: BENCH TYPE 1 and BENCH TYPE 2 will be measured in place per each unit installed.

Basis of Payment: The work under this item will be paid for at the contract unit price per each **BENCH TYPE 1** and **BENCH TYPE 2**, which price will include labor, anchor bolts and bolt installation, equipment, materials and incidental work necessary to complete the installation as specified.

ITEM 150 - ****** - BIKE RACK**

Description: This item must consist of furnishing and installing new bicycle racks.

General Requirements: Contractor to coordinate with CDOT Bike Program at 312-744-4600 prior to siting of racks. Contractor is responsible for furnishing and installing of new bike racks according to the standard details in the construction plans, and for any damage incurred to racks during installation. Removal of existing racks and abandoned bicycles attached to existing racks will be addressed under the item BIKE RACK REMOVAL.

RACK:

Type B, A3, A5 rack, and related quantity to be specified in the detail drawings.

Material:
Bicycle Rack - The bicycle rack must be fabricated from square Domestic (U.S. manufactured) Steel tubing, in accordance with ASTM A500 Grade B, 2" X 2" in size with 0.25" wall mechanical and structural mild steel tubing. The tubing must be bent in a one piece width as shown on the contract documents. The bicycle racks must not be welded in sections. Only the base plate must be welded to the steel tubing by using stainless steel A.C.D.C. 309L 16 or 17 electrode rod for welding. Color of the coating must be Black.

The coating must be applied only after the bicycle rack has been fabricated.

The final product will be rejected if the coating cracks, ripples in the curved areas or is otherwise damaged due to the fabrication and/or shipping.

Fastener-Expansion anchor to be stainless steel mushroom head spike, ½" x 5", long according to ASTM A193

Base plates - Base plates must be fabricated from Domestic (U.S. manufactured) Stainless Steel, 3/8" thick, in accordance with ASTM-T-304.

Coating of Bicycle Rack

1. Steel:
    a. Shot blast to near white steel.
2. Iron phosphate pre-treatment.
3. Primer:
    a. Thermosetting epoxy powder coating (Corvel Zinc Gray 13-7004).
    b. Electrostatic application, cure schedule approximately 6 minutes at 250 degrees.
    c. Thickness 1.8 - 10 mils.
4. Topcoat:
    a. Triglycidyl Isocyanurate (TGIC) Polyester powder coating.
    b. Electrostatic application cured in oven for approximately 20 minutes at 250 degrees.
    c. Total coatings: 8-10 mils.

d. Finish color to be black.

Submittals

Bicycle Rack- Shop drawings or catalog cut.

Fastener - Catalog cut.

Certifications -
1. Submit manufacturer's certification that the tubing and coatings meet the project specifications.
2. Prior to production, the manufacturer of the bicycle racks is to submit certification that the steel to be used is in compliance with the "Steel Products Procurement Act" as described in Article 112.11 of the Special Conditions.

Samples: Submit 3-12" long samples of the tubing with finish coat and 4 fasteners.

Installation: Bicycle Racks must be located according to the plans and as designated by the Commissioner. Fastening of the bicycle rack must be surface mounted on concrete only. Locations of racks to be verified in the field. Drilling through rebar, furnishing electricity, traffic control and shims are incidental to bicycle rack installation. Siting of racks will be coordinated at the end of the job with CDOT, Division of Project Development, Bike Program staff.

Method of Measurement: BIKE RACK will be measured per each bike rack.

Basis of Payment: BIKE RACK will be paid for at the contract unit price for each bike rack, which will include furnishing and installing new racks with mounting hardware.

ITEM 151 - ****** - TRASH RECEPTACLE, TYPE 1**

Description: This work must consist of furnishing and installing a new trash receptacle with a plastic liner and anchoring hardware at the locations specified in the Contract plans or as directed by the Commissioner.

General Requirements: Each trash receptacle will be placed at the location indicated in the plans. The locations will be field marked and verified for approval by the Commissioner.

ASSEMBLY
The anchor bolt must be drilled and grouted into the sidewalk surface only after the Trash Receptacle location has been finalized.

MATERIALS

TRASH RECEPTACLE TYPE 1

Materials must be as specified in the plans and must be "Gloss Black" in color , steel trash receptacle , 36 gallon capacity with plastic liner by the following suggested manufacturers:

Victor Stanley, Inc.,
Wausau Tile, Inc.
Trystan, Inc.

Materials should be similar to the Victor Stanley Model, Ironsites Series S-42.

FINISH- Finish must be powder coating or similar coating process

COLOR – Color shall be gloss black

SUBMITTALS
Submit manufacturer's technical data for each manufactured product, including certification that each product complies with specified requirements. Submit shop drawings showing complete information for fabrication. Include anchoring detail.

Contractor shall submit a 4" x 6" finish sample of metal in gloss black.

Method of Measurement: TRASH RECEPTACLE TYPE 1 will be measured in place per each installed.

Basis of Payment: The work under this item will be paid for at the contract unit price per each as shown in the Schedule of Unit Prices for TRASH RECEPTACLE TYPE 1 which price will include all labor, anchor bolt and bolt installation, equipment, materials and incidental work necessary to complete the work as specified.

ITEM 152 - ***** - TRENCH AND BACKFILL WITH SCREENINGS**

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 Division of Electrical Operations Standard Drawings No. 579 and No. 813. This work must meet all applicable requirements of Article 815 of the Standard Specifications.

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.

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.

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.

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
	813
	579

ITEM 153 - ****** - HANDHOLE, 30"X36" WITH 24" FRAME AND LID**
ITEM 154 - ****** - HANDHOLE, HEAVY DUTY, 36" X 36" WITH 24" FRAME AND LID**

Description: This item is for supplying and installing an electrical handhole 30" in diameter with a 24" frame and lid or a handhole 36" in diameter with a 24" frame and lid in a parkway or sidewalk, or a handhole 36" in diameter with a 30" frame and lid in pavement or in a driveway.

Material: The frame and lid must meet the requirements of Material Specification 1458. The handhole must meet the requirements of Material Specification 1528. A 24" frame and lid must also meet the requirements of Standard Drawing 872. A 30" frame and lid must also meet the requirements of Standard Drawings 874 and 10927. Bricks must meet the requirements of Article 1041 of the Standard Specifications. All other materials used must meet the appropriate material requirements of the Standard Specifications.

Method of Construction: The handhole will be a precast concrete structure, or, if conditions merit, a cast in place concrete structure, complete with cast iron frame and cover, and conforming in detail with either Drawing Number 867, Drawing Number 866, or Drawing 871, except that the number of conduit openings must be as shown on the construction plans.

Each handhole must be installed at the location specified on the plans or at the location identified by the Resident Engineer.

The area where the handhole is to be placed must be properly excavated. All disposable material must be properly disposed of per Section 202.03 of the Standard Specifications. Each handhole must be set or constructed on a foundation of loose stone not less than eight inches (8") deep. The 36" handhole for pavement installation must have a floor as shown in Drawing Number 871. The frame casting must be accurately set on a full bed of mortar to the finished elevation so that no subsequent adjustment will be necessary. It is desirable not to use a neck for the frame. However, if approved by the Resident Engineer, mortar and brick, or mortar and concrete rings, may be used to adjust to the proper grade. Adjustment rings, bricks, and frames must be set in a full mortar bed. Use of partial bricks will not be allowed. Bricks must be laid in full header courses only. Mortar must be mixed in a proportion of one (1) part of cement to three (3) parts sand by volume of dry materials. After entering laterals have been installed in place in the handhole, the openings in the wall must be plugged in an approved manner flush with the inner surface. If backfill is required, screenings must be used and properly compacted. Parkway must be restored to the proper grade. Pavement must be properly restored to the correct grade. Patching of the pavement must be done with high early strength concrete meeting the requirements of Articles 1001 and 1020 of the Standard Specifications. Sidewalks must be restored to the proper grade using a 5 inch thickness of concrete. The inside of the handhole must be clean of all debris.

Method of Measurement: This item will be paid for at the contract unit price per each unit installed.

Basis of Payment: The necessary excavation, backfilling and restoration of parkway and pavement must be made in accordance with the foregoing specifications, and the cost thereof must be included in the unit price each for installing HANDHOLE, 30"X36" WITH 24" FRAME AND LID or HANDHOLE, HEAVY DUTY, 36" X 36" WITH 24" FRAME AND LID. No additional payment will be allowed for restoring parkway, sidewalk, or pavement. Removal of sidewalk or pavement will be paid for separately under a different pay item.

MATERIAL SPECIFICATION	DRAWING		
1458	866	874	871
1528	867	872	10927

ITEM 157 - ***** - ELECTRICAL MANHOLE 3'X4'X4' WITH 24" FRAME AND LID**

Description: This item will consist of furnishing and installing an electrical manhole of the dimensions indicated with a 24" or frame and lid.

Material: The concrete manhole must meet the applicable requirements of Material Specification 1528. The frame and lid must meet the requirements of Material Specification 1458. A 24" frame and lid must meet the requirements of Standard Drawing 872. A 30" frame and lid must meet the requirements of Standard Drawings 874 and 10927. Bricks must meet the requirements of Article 1041 of the Standard Specifications. All other materials used must meet the appropriate material requirements of the Standard Specifications.

Method of Construction: The manhole will be a precast concrete structure, or, if conditions merit, a cast in place concrete structure, complete with cast iron frame and lid. A 3'X4'X4' manhole with a 24" frame and lid must conform to the requirements of Drawing 730. The number and size of conduit openings will be as shown on the construction plans.

Each manhole will be installed in paved sidewalk, earth parkway, or in pavement at the location specified on the construction plans or at a location as directed by the Resident Engineer.

The area where the manhole is to be placed must be properly excavated. All disposable material will be properly disposed of per Section 202.03 of the Standard Specifications. Each manhole must be set or constructed to conform with the appropriate City of Chicago drawings, except that the number and size of conduit openings will be in accordance with the construction plans. The frame casting must be accurately set on a full bed of mortar to the finished elevation so that no subsequent adjustment will be necessary. Mortar and brick, or mortar and concrete rings, may be used to adjust to the proper grade. Adjustment rings, bricks, and frames must be set in a full mortar bed. Use of partial bricks will not be allowed. Bricks must be laid in full header courses only. In no instance will the neck of the manhole exceed two (2) feet in height. Mortar will be mixed in a proportion of one (1) part cement to three (3) parts sand by volume of dry materials. After entering laterals have been installed in place in the manhole, the openings in the wall must be plugged in an approved manner flush with the inner surface. If backfill is required, screenings must be used and properly compacted. Parkway must be restored to the proper grade. Pavement must be restored to the correct grade. Patching of the pavement must be done with high early strength concrete meeting the requirements of Articles 1001 and 1020 of the Standard Specifications. Sidewalks must be restored to the proper grade using a 5 inch thickness of concrete. The inside of the manhole must be clean of all debris.

Replacing Handhole with Manhole. When a present handhole is to be replaced with a new manhole, the handhole must be broken down and all debris removed. This will be paid for as a separate pay item. The present laterals and cables must be maintained during breakdown of a present handhole and construction of a new manhole. Present laterals must be cut back to terminate at a distance from the inner face of the new manhole wall, as directed by the Resident Engineer. The cost of cutting back the present laterals will be included in the cost of the new manhole. New laterals terminating in the manhole must be included in the cost of installing new

lateral. The new manhole must be installed in accordance with the appropriate City of Chicago drawings. All other work associated with this replacement will be considered incidental to this pay item.

Method of Measurement: This item will be measured per each unit installed.

Basis of Payment: The unit price for installing manholes will include necessary excavation, backfilling and restoration of parkway and pavement in accordance with the foregoing specifications. No additional payment will be allowed for restoring parkway or the restoration of sidewalk or pavement. Removal of sidewalk or pavement will be covered by separate pay items. New conduit, if necessary, will also be paid for separately. The unit cost will be for complete installation for each unit for ELECTRICAL MANHOLE 3'X 4'X 4' WITH 24" FRAME AND LID.

MATERIAL SPECIFICATION		DRAWING	
1458	1528	730	872
		874	10927
		729	733
			732

ITEM 156 - ******* - DRILL EXISTING MANHOLE OR HANDHOLE**

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.

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.

Method of Measurement: This work will be measured per each hole drilled.

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

ITEM 157 - ****** - CLEAN EXISTING MANHOLE OR HANDHOLE**

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.

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.

Method of Measurement: This work will be measured per each manhole/handhole cleaned.

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.

ITEM 158 - ****** - CONDUIT IN TRENCH, 3/4" GALVANIZED STEEL**
ITEM 159 - ****** - CONDUIT IN TRENCH, 2" GALVANIZED STEEL**
ITEM 160 - ****** - GALVANIZED STEEL CONDUIT ATTACHED TO STRUCTURE, ¾"**
ITEM 161 - ****** - CONDUIT IN TRENCH, 2" PVC**
ITEM 162 - ****** - CONDUIT IN TRENCH, 3" PVC**
ITEM 163 ****** - CONDUIT IN TRENCH, 2" PVC SCHEDULE #80**
ITEM 164 - ****** - CONDUIT IN TRENCH, 3" PVC SCHEDULE #80**
ITEM 165 - ****** - GALVANIZED STEEL CONDUIT PUSHED 2"**
ITEM 166 - ****** - GALVANIZED STEEL CONDUIT PUSHED 3"**

Description: This work will consist of furnishing and installing a conduit lateral of the type and size specified.

Material: 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.

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.

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 for short distances only. The normal installation method for coilable conduit is directional boring. 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.

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.

Basis of Payment: This work will be paid for at the contract unit price per lineal foot for 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	DRAWINGS
1462	579
1533	813

ITEM 167 - ****** - GROUND ROD IN HANDHOLE**

General: This item will consist of providing and installing a ground rod in a handhole, adjacent to a foundation or manhole, or at any location as described by the plans or as directed by the Resident Engineer.

Material: The ground rod and clamp must meet the requirements of Material Specification 1465. The grounding electrode, if required, will be a one conductor number 6 AWG solid, soft drawn bare copper wire.

Construction: The ground rod will be driven into undisturbed soil as straight down as possible. In a handhole, no more than 6 inches of the rod should protrude into the handhole floor. In the handhole, a clamp must be attached to accommodate #6 through #12AWG bare copper wire.

For a manhole or foundation, the ground rod must be driven adjacent to the manhole or foundation. Enough soil must be removed to accommodate driving the rod and to extend the cable into the foundation or manhole. The top of the ground rod must be lat least 30 inches below grade. A ground rod should never be installed in the sump of a manhole. The wire will enter the manhole through one of the knockouts provided near the top of the manhole. Any disturbed soil must be restored.

If required, a bare #6 copper wire must be exothermically welded to the ground rod. The wire will be extended into the manhole or foundation. The length of the wire must be such that there will be no strain in the wire once it is attached to a grounding lug or ground bus.

Method of Measurement: The unit of measurement will be each, for each ground rod installed.

Basis of Payment: Each ground rod installed will include labor and material, including grounding clamp and copper wire if required. Payment will be for each GROUND ROD IN HANDHOLE. No additional payment will be made for welding the wire to the rod, or for providing and attaching the bare ground wire. No additional payment will be made for excavating or restoring the soil adjacent to a foundation or manhole.

MATERIAL SPECIFICATION
1465

ITEM 168 - ****** - ROD AND CLEAN DUCT IN EXISTING CONDUIT SYSTEM**

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.

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.

Basis of Payment: This work will be paid for at the contract unit price per lineal foot for ROD AND CLEAN DUCT IN EXISTING CONDUIT SYSTEM 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 169 - ****** - CONCRETE FOUNDATION FOR BASE MOUNTED "SUPER P" CABINET**

Description: This item will be for all work necessary for installing a foundation for a "Super P" cabinet.

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.

Construction: The Contractor will install a concrete foundation for a base mounted traffic signal controller cabinet, as shown on City of Chicago Drawing Number 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.

Method of Measurement: This work will be measured as each for each unit installed complete.

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 BASE MOUNTED "SUPER P" CABINET.

MATERIAL SPECIFICATION	DRAWING
1465	888A
1467	
1533	

ITEM 170 - ****** - CONCRETE FOUNDATION FOR BASE MOUNTED STREET LIGHT CABINET**

General: The Contractor will install a concrete foundation for a base mounted street light controller cabinet, as shown on City of Chicago Drawing Number 876.

Material: Concrete will be Portland cement concrete, SI Class, meeting the requirements of Article 1020 of the Standard Specifications. Ground rods must meet the requirements of Material Specification 1465. Conduit will be PVC meeting the requirements of Material Specification 1533. Anchor rods must meet the applicable requirements of Material Specification 1467.

Construction: The contractor will install the concrete foundation as shown on Drawing 876. Work under this item will be performed in accordance with Article 800 of the Standard Specifications.

The foundation must have a minimum depth of at least fifty inches (50") below grade and will have large radius conduit elbows in quantity, size and type shown. The elbow ends above ground will be capped with standard conduit bushings. The Contractor must furnish anchor bolts, hardware, conduit elbows, and all other material shown on the foundation construction drawing.

All excavation and restoration of parkway will be included in this item. If the foundation is in sidewalk, an expansion joint will be required between the sidewalk and the foundation.

Method of Measurement: This work will be measured as each for each unit installed complete.

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 BASE MOUNTED STREET LIGHT CABINET.

MATERIAL SPECIFICATION	DRAWING
1465	876
1467	
1533	

ITEM 171 - ****** - CONCRETE FOUNDATION, 24"X9' WITH 1 1/4" A.R.**
ITEM 172 - ****** - CONCRETE FOUNDATION, 28"X7' WITH 1 1/4" A.R.**
ITEM 173 - ****** - CONCRETE FOUNDATION, 30" DIAMETER, 1 71/4" BOLT CIRCLE, 1 1/4" A.R.**
ITEM 174 - ****** - CONCRETE FOUNDATION, 24", OFFSET, 1 1/4" A.R.**

Description: The foundation will be a poured in place concrete structure used for structurally supporting street light poles or traffic signal poles.

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.

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 169 is a foundation for a traffic pole which can accommodate a 16, 20, or 26 foot monotube arm (Standard Drawing 818). Item 172 is a foundation for a traffic pole which can accommodate a 30 foot monotube arm (Standard Drawing 816). Item 171 is a foundation for a traffic pole which can accommodate a 35, 40, or 44 foot monotube arm (Standard Drawing 817). Item 170 is a foundation for the Chicago 2000 Gateway and Pedestrian ornamental light poles (Standard Drawing 953).

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.

Method of Measurement: This item will be measured per each foundation installed complete.

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 FOUNDATION 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 175 - ****** - ELBOW, CONDUIT, STEEL, 2", ADJACENT TO EMBEDDED POLE/STRUCTURE**
ITEM 176 - ****** - ELBOW, CONDUIT, STEEL, 3", ADJACENT TO EMBEDDED POLE/STRUCTURE**

Description: This item will consist of furnishing and installing a steel conduit elbow of the size indicated adjacent to a vertical surface to connect and extend a horizontal underground conduit lateral to a proposed extension of that lateral to run vertically up the face of an embedded pole, a structural steel column, or a wall of a building or an abutment for the installation of cables for street lighting, or traffic signals at the location shown on the plans or as directed by the Resident Engineer.

Material: The material must meet the requirements of the Material Specification 1462 for Rigid Steel Conduit, Zinc coated.

Method of Installation: The earth must be excavated to form a trough approximately one foot wide by three feet deep adjacent to the vertical surface at the desired location and extending in a direction to meet the lateral to which the elbow will be connected. Sidewalk or pavement removal required for this excavation will be performed and paid for as work under the appropriate pay item and will not be a part of this item. A groove or channel of sufficient size to accommodate the desired elbow, and to allow the elbow to fit flush against the pole or column, will be cut into the concrete of the pole encasement, the column or the abutment foundation, as required, by use of a hydraulic chipping hammer, drill or saw. The groove must be cut in a workmanlike manner using care that the column foundation will not be cracked nor will the pole encasement concrete be cracked and separated from the pole.

The elbow must be grouted to the concrete encasement of the pole, column or abutment foundation with a mortar consisting of one (1) part cement to three (3) parts sand by volume of dry materials to support the elbow in a vertical position. The elbow must extend eleven inches (11") above the finished surface grade and must be attached to the pole or column with stainless steel banding or to the abutment wall with a pipe clamp secured to the wall.

The top of the pole encasement must be finished smooth. The earth must be replaced and compacted in the area of the new elbow and all concrete debris and surplus backfill must be removed from the area.

Method of Measurement: This item will be measured per each elbow installation, complete.

Basis of Payment: This work will be paid for at the contract unit price EACH for a Steel Conduit Elbow adjacent to an Embedded Pole, Column, or Wall, and will be payment in full for furnishing and installing the elbow, providing all hardware and materials, removing and replacing any fill, and repairing the concrete encasement of the pole or footing.

MATERIAL SPECIFICATION	DRAWING
1462	561

ITEM 177 - ****** - INTERCEPT EXISTING CONDUIT**

Description: This item will consist of intercepting an existing city conduit or conduits for the purpose of installing a new foundation, a new manhole or handhole, or making a connection to a new conduit.

Construction: Work under this item will be performed in accordance with Article 800 of the Standard Specifications, Bureau of Electricity Standards and the City of Chicago Electrical Code, except as herein modified.

The contractor must carefully cut the conduit so that the cut conduit ends will be flush with the inside walls of the new manhole or handhole. Where existing cables are in service in the conduit(s) being intercepted, conduit(s) must be carefully split so that all working cables are not interrupted. If conduit(s) are concrete encased, such concrete must be removed as required. Any concrete encasement damaged during installation must be restored as needed.

Method of Measurement: This work will be measured on a per each basis for each conduit end cut.

Basis of Payment: This work will be paid for at the contract unit price per each for INTERCEPT EXISTING CONDUIT, which price will include all necessary excavation, backfilling, and restoration of a parkway. No additional compensation will be made for removal or placement of concrete. This item will include all work necessary to bring the conduit into the manhole, handhole, or foundation, or to make the necessary connection to a new conduit. The contractor will furnish all materials for a complete installation

ITEM 178 - ****** - COILABLE CONDUIT, HDPE #80, DIRECTIONAL BORING, 2"**
ITEM 179 - ****** - COILABLE CONDUIT, HDPE #80, DIRECTIONAL BORING, 3"**

Description: This work will consist of the installation of flexible conduit along and/or across roadways by the directional boring method. The conduit will be for street lighting or traffic signal cable. When specified, the coilable conduit will come with cable pre-installed in the conduit.

Materials: All conduits must be coilable high strength polyethylene conforming to the applicable requirements of Material Specification 1533 and to the National Electrical Manufacturers Association, Standard TC7. The conduit must also meet the requirements of ASTM-D1248, Type III, Grade PE34, Category 5, Class C, and the requirements of Section 1088.01(c) of the Standard Specifications. The average wall thickness of the schedule 40 conduit must be .15 inches. The average wall thickness of the schedule 80 conduit must be .2 inches. The nominal inside diameter of each conduit must equal the designated conduit size.

Cable must meet the requirements of Material Specification 1534. The cable will consist of three separate conductors twisted together. Two conductors must be #6 AWG, and one conductor must be #8 AWG.

Construction Requirements: The Contractor will be responsible for obtaining all necessary permits from the Chicago Department of Transportation (CDOT) for work in the public way. The Contractor will provide necessary notification to the Chicago Utility Alert Network (CUAN) 48 hours before planned work in the public way. The Contractor will organize a CUAN meet at the work site for the purpose of identifying all underground obstructions. The contractor will be responsible for any and all damage caused to existing facilities, both private and public, including Bureau of Electricity infrastructure.

The Contractor will open excavations for conduit access, the location of underground obstructions (find holes), and the pulling back of conduit, as necessary to perform the work. The excavations must be properly protected to insure that vehicular and pedestrian traffic are not endangered. Traffic lane blockage must be minimized and the intersection and roadway must be kept safe at all times during the installation work.

The top of the conduit or duct must be installed a minimum of thirty inches (30") below grade. Grade will mean the street surface level or the top of parkway. The contractor will later pick-up and extend the conduit to manholes, hand holes, foundations, etcetera as required by the plans or as directed by the Resident Engineer.

Conduit will be cleaned of dirt, debris, bentonite or other foreign materials by the use of a swab or mandrel. If cable is not to be installed immediately, a 1/4" polyethylene pull line will be installed in each conduit.

Any excavation will be backfilled as soon as possible after the installation of the conduit. Soil excavated may only be used for backfilling when approved by the Engineer. Backfill will be a fine or crushed screening aggregate material meeting the requirements of Section 1003.04 of the Standard Specifications. Cinders, rocks, or other inappropriate materials will not be permitted to be used as backfill material. Backfill material will be deposited in the excavation 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 excavation.

Excavations which are to remain open will be covered with steel plates, minimum 2" thickness for sidewalks and 1" thickness for streets, and will be secured in place as directed by the Engineer. Any costs involved will be considered incidental.

The Contractor will remove all excavated material, except that which is acceptable for backfilling, from the job site. Spoil will be disposed of according to Section 202.03 of the Standard Specifications.

Sidewalk removal and replacement and pavement removal and replacement, if necessary to accomplish the directional boring, will be done as separate pay items.

The contractor will directional bore and install the proper sizes of conduit as indicated on the plans provided by the Bureau of Electricity. The contractor must follow the plans and directional bore and install conduit from point to point as indicated. Conduit will be installed and p-lined and any excavations for find holes etcetera must be restored to original condition including pavement restoration, sidewalk restoration, and parkway restoration. Failure to accomplish point to point installation or to properly restore excavations will result in non-payment for that particular point-to-point installation.

Method of Measurement: This item will be paid for the number of lineal feet bored with conduit installed from point to point, measured in place. The length will be the distance horizontally from point to point. No vertical distances will be measured or applied.

Basis of Payment: This work will be paid for at the contract unit price per lineal foot for the type and number of conduits specified, measured with conduit in place, for COILABLE CONDUIT INSTALLATION BY DIRECTIONAL BORING. Such price will include the cost of all conduit, conduit fittings, excavations, furnishing and placing all required backfill material, restoration of all find holes, plating and protection of all end holes when required, disposal of all surplus excavated material, and any trenching and backfill made for the purpose of placing conduit. Restoration of all pavements and sidewalks will be paid for separately.

ITEM 180 - ****** - POLE, STEEL, 34'6", ANCHOR BASE, 10"D, 7 GUAGE**
ITEM 181 - ****** - POLE, STEEL, 34'6", ANCHOR BASE, 10"D, 3 GUAGE**
ITEM 182 - ****** - POLE, STEEL, 34'6", ANCHOR BASE, 11"D, 3 GUAGE**

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.

Material: The material of the pole must meet the requirements of Material Specification 1447.

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.

Method of Measurement: This item will be measured per each unit installed, complete with anchor bolt covers, pole cap, and handhole cover.

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	DRAWING	
1447	837	827
	808	824

ITEM 183 - ****** - PAINT EXISTING TRAFFIC SIGNAL POLE**
ITEM 184 - ****** - PAINT EXISTING TRAFFIC SIGNAL POLE AND MAST ARM**

Description: This work will consist of field painting existing steel and aluminum structures including poles and arms that support street lights and traffic control signals, controller cabinets for street lights and traffic signals, traffic signal housings, and street light luminaire housings

Material: All paints and painting materials intended for applications specified herein must be certified by the contractor to be of highest quality, must be from the same manufacturer, and must conform to the following, as applicable:

a. Naptha. The solvent to be used for wiping down all metallic surfaces prior to application of paint must be NAPTHA conforming to ASTM Standard D838.

b. Primer. This paint must meet the requirements of Section 4(composition) and Section 5 (properties) of the Steel Structures Painting Council's Paint Specification No. 25 for red iron oxide, zinc oxide, raw linseed oil and alkyd primer as outlined in Volume 2, Systems and Specifications, Third Edition.

c. Intermediate Coat. The paint must meet the same requirements as the primer except that it will contain a contrasting shade of iron oxide/ or be tinted or shaded to produce a distinct contrast of at least 10 Hunter Delta E units compared to the primer.

d. Finish Coat. This paint must meet the requirements of Section 4 (composition) and Section 5 (properties) of the Steel Structures Painting Council's Paint Specification No. 21 for lead free white or colored silicone alkyd paint, Type 1, high gloss as outlined in Volume 2, Systems and Specifications, Third Edition.

e. Color. A paint sample must be submitted for approval prior to authorization to paint. The color will be as specified by the Engineer. The sample must be in the form of a 4" by 8" color chip. The contractor must provide a field-painted sample, if requested by the Commissioner. The field sample must be of the same type of equipment to be painted and will be chosen by the Commissioner. Color will be green, gray, black, or another color as specified.

f. Product Data. The contractor must submit the manufacturer's technical information, label analysis, and application instructions for each material proposed for use. Each material must be listed and cross-referenced for the specific coating, finish system, and application. Each material must include the manufacturer's catalog number.

Delivery, Storage, and Handling: The contractor must deliver, store, and handle the paint as herein specified.

a. The materials must arrive at the job site in the manufacturer□s original, unopened packages and containers bearing the manufacturer□s name label, product name, product description, manufacturer□s stock number, date of manufacture, contents by volume for pigment and vehicle constituents, thinning instructions, application instructions, and color name and number.

b. Materials to be stored should be kept in tightly covered containers in a well ventilated area at a minimum ambient temperature of 45º Fahrenheit.

Preparation of Surfaces:

a. Steel Surfaces. Remove loose or scaling paint, dirt, oil grease, rust and foreign matter, as necessary, to receive paint. Wire brushing, where specified herein, must be done with an approved power tool operated from a portable power source. After wire brushing, the complete surface must be thoroughly wiped with a rag containing NAPTHA.

b. Aluminum Surfaces. Remove loose scale and paint, dirt, oil, grease and foreign matter, as necessary, to receive paint. Wire brush surfaces, where necessary, to remove loose scale. Wire brushing, where specified herein, must be done with an approved power tool operated from a portable power source. After wire brushing, the complete surface must be thoroughly wiped with a rag containing NAPTHA.

c. Weather Conditions. Do not apply paint coatings when temperature is below 40º F., or during periods of rain, fog, snow, or when relative humidity is above 85 %.

d. Application Conditions. Surfaces to be painted must be clean, dry, and relatively smooth. Each paint coating must be applied smoothly and worked out evenly. Paint must be thoroughly mixed just prior to application. Thinning must be held to a minimum, and must be done only when required for proper application. Thinners to be used will be the manufacturer's recommended thinner for the paints used; mixed thoroughly to assure complete blending with the coating. Spray painting will not be permitted when wind conditions are greater than 15mph. Painting must be done as soon after cleaning as possible.

Detail Painting Requirements:

a. Street Light Poles. Street light poles to be painted under these specifications are steel structures which will vary from twenty-seven (27) to thirty (30) feet in height, with average surface required to be painted of approximately forty-eight (48) square feet. Some rusting and/or bare spots will be encountered which the contractor will be required to wire-brush. The pole must be thoroughly wiped with NAPTHA, and the finish coating applied.

b. Mast Arm Brackets and Electrical Luminaries. Mast arms which are attached to the street light poles will consist of 2-inch steel pipe sections which will vary between eight feet (8') and fifteen feet (15') in length. Mast arms in twelve foot (12') and 15 foot (15') sizes will have a supporting strut of two inch (2") steel pipe. Surface scale and rust will be wire-brushed, and these mast arms thoroughly wiped with NAPTHA, and finish painted.

c. Traffic Signal Post. Aluminum and steel posts consist of five inch (5") pipe sections atop a conical base or base flange sixteen inches (16") in diameter, and will vary in height from three feet six inches (3' - 6") to twenty feet (20'). Spot scaling must be wire-brushed and the posts thoroughly wiped with NAPTHA, and finish painted.

d. Street Light Controllers. The control cabinets will be cast aluminum and are approximately 18" x 14" x 30" in size. They will be mounted atop a three foot six inch (3' 6") high post. The Contractor will wire-brush, as necessary, and thoroughly wipe the complete cabinet and casting with NAPTHA, and apply a finish coating.

Basis of Payment: This work will be paid for at the contract unit price each for paint existing street light or traffic equipment complete, which will be payment in full for all labor and materials necessary in painting the existing equipment.

ITEM 185 - ****** - BASE, BALLAST HOUSING, STEEL, 7 GAUGE**

Description: This work will consist of furnishing and installing a ballast housing on a concrete foundation, as shown on the plans or as directed by the Engineer. The foundation must have either a 10 inch or 15 inch bolt circle.

Material: The ballast housing must meet the requirements of Material Specification 1375, and Standard Drawing 785.

Installation: The ballast housing must be installed onto the foundation using the hardware provided for the foundation anchor rods. No double nutting or shims will be used.

Basis of Payment: This work will be paid for at the contract unit price per each BASE, BALLAST HOUSING, STEEL, 7 GAUGE, which will be payment in full for furnishing and installing the base.

MATERIAL SPECIFICATION	DRAWING
1375	785

ITEM 186 - ****** - RACK, SECONDARY, AERIAL 2-WIRE**

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.

Materials: The materials of the secondary rack must conform to the requirements of Specification 1443.

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.

Basis of Payment: This work will be paid for at the contract price each for a RACK, SECONDARY AERIAL 2-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	DRAWING
1443	11940

ITEM 187 - ****** - CONDUIT RISER ON POLE, 2"**
ITEM 188 - ****** - CONDUIT RISER ON POLE, 3"**

Description: This item will consist of furnishing and installing a conduit riser topped with a weatherproof service head of the size indicated at the location shown on the plans and attached to an embedded steel pole, for the purpose of enclosing electric cables which will extend from an underground facility to the top of the pole at which point the conductors may be connected to aerial conductors or to a device located near the top of the pole.

Material: The material must meet the requirements of Material Specification 1462 for Rigid Steel Conduit, Zinc Coated.

Service Riser: The galvanized rigid steel conduit riser twenty-five (25) feet long threaded at both ends must be connected at its lower end by means of a conduit coupling to a large radius elbow installed under a separate pay item. The conduit will be secured to the pole by means of three-quarter inch stainless steel banding installed at five foot intervals up the pole starting at 3 feet above grade. A service entrance head of the nominal size of the conduit must be securely attached to the upper end of the conduit. The riser will be wiped clean of dirt and foreign materials before painting, and must be painted with one coat of exterior enamel of the color specified. The complete cost of painting must be included in this item, and will be considered incidental to the installation of the riser.

Basis of Payment: This work will be paid for at the contract unit price each for a CONDUIT RISER UP POLE, which will be payment in full for furnishing and installing the riser complete in place.

MATERIAL SPECIFICATION
1462

ITEM 189 - ****** - CIRCUIT BREAKER, 2-POLE, 50 AMP, 600 VOLT, IN EXISTING STREET LIGHTING CONTROLLER**
ITEM 190 - ****** - CIRCUIT BREAKER, 1-POLE, 70 AMP, 600 VOLT, IN STREET LIGHTING CONTROLLER**

Description: This item will consist of furnishing and installing a single pole or double pole thermal-magnetic circuit breaker in an existing arterial street light controller at the designated location creating a controlled power source to supply a proposed traffic signal controller or other electrical device or circuit.

Material: The material of the circuit breaker must meet the requirements of Specification 1428.

Installation: The circuit breaker must be mounted on a 3/8" thick phenolic linen base bakelite panel 3" x 8" which will be attached on the inside of the lower left hand side of the controller cabinet with 4-1/4"-20x7/8" brass screws in holes which will be drilled and tapped into the side of the cabinet for this purpose. The ends of any screws protruding through the side of cabinet wall must be filed or ground off flush with the face of the cabinet. The bakelite panel shall be set out from the wall of the controller cabinet using four 1/4" bakelite spacer washers, one at each mounting screw position.

The line side terminal of the circuit breaker must be connected to one of the line side terminals of the main circuit breaker with a 1/C - #4 - 600V - 90 degree C. - insulated copper cable trained around the cabinet in a neat and workman like manner. This cable will be a part of the installation of the circuit breaker and will not be a separate pay item. The installation and connection of the load side cables servicing the traffic signal controller will be a part of the installation of service cable and not a part of the installation of the circuit breaker.

Basis of Payment: This item will be paid for at the contract unit price each for a CIRCUIT BREAKER IN STREET LIGHT CONTROLLER complete in place which will constitute payment in full for furnishing, installing and making line side connections of the circuit breaker.

MATERIAL SPECIFICATION
1428

ITEM 191 - ****** - SERVICE INSTALLATION, 100 AMPERES**
ITEM 192 - ****** - SERVIVE INSTALLATION, 200 AMPERES**

Description: This work will consist of furnishing and installing a service on a Commonwealth Edison Company wood pole for either a 120 volt traffic signal service installation, or for a 240 volt street lighting service installation per City of Chicago Drawing Number 11925.

The 100 ampere installation can be used for either a 120 volt or 240 volt service. The 200 ampere installation can be used only for the 240 volt service.

Service Junction Cabinet: The cabinet must be cast from aluminum and met all the requirements of standard drawing 11922. Its dimensions must not exceed eight (8) inches in width, eighteen (18) inches in height and nine (9) inches in depth, and it must be weather proof. It must contain a two (2) pole disconnecting device, with bridge contacts and barrier strip, subject to approval. The disconnecting device must be rated for 200 amps and 600 volts. A suitable ground lug, subject to approval, to accommodate a 1/C #2, 1/C #4, 1/C #2/0 or 1/C #1/0 AWG stranded copper conductor must be provided. Any alternate cabinets which are considered equal to this may be considered.

Cable Grip: A one and one quarter inch (1 1/4") cable grip fitting must be installed at top of cabinet to accommodate a 3/C #2, #4, #2/0 or #1/0 AWG service cable.

Service Riser: A two (2) inch galvanized rigid steel conduit riser terminated at the bottom with a galvanized rigid steel, large radius, conduit elbow must be installed by the contractor on the Commonwealth Edison Company service pole as shown on City of Chicago Drawing Number 11925. The top of the riser must terminate in the service junction cabinet and the end of the elbow must connect to the horizontal conduit lateral leading to the control cabinet. Payment for the riser, elbow, and attachments must be included in the price bid for the complete Commonwealth Edison Company pole service junction unit. The laterals will be paid for separately under different pay items.

Cable: A sufficient length of three (3) conductor service entrance cable must be coiled at the top of the box in order to reach the Commonwealth Edison Company secondary wires for connection. The three (3) conductor service entrance cable must meet the requirements of Bureau of Electricity Specification Number 1457, or an approved equal. The black and red conductors must be connected to the disconnect device and the white conductor to the ground lug, for the 240 volt street lighting service installation. The black conductor must be connected to the disconnect, and the white to the ground lug, for the 120 volt traffic signal service installation. The red conductor must be taped and coiled inside box for future use.

Cables in Service Riser: Cables must extend continuously from the load side of the disconnect device, down the riser and elbow, and in the conduit lateral to the control cabinet. Payment for cables in riser and elbow will be included in separate pay items, and will not be considered as part of this pay item.

Basis of Payment: This work will be paid for at the contract unit price EACH for SERVICE INSTALLATION 100 AMPERE or SERVICE INSTALLATION 200 AMPERE, which price must be payment in full for furnishing and installing the service equipment complete. Any charges by the utility company to provide electrical service to the service installation will be paid for by the contractor.

MATERIAL SPECIFICATION	DRAWING
1457	11922
1462	11925

ITEM 193 - ****** - ELECTRIC CABLE IN CONDUIT, 1/C #4**
ITEM 194 - ****** - ELECTRIC CABLE IN CONDUIT, 1/C #2/0**

Description: This work will consist of furnishing and installing electric cable as specified. The cable will be installed in conduit underground.

Material: The cable must meet all requirements of Material Specification 1534 of the Bureau of Electricity, City of Chicago.

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-existant 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.

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.

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 195 - ****** - TRIPLEX CABLE IN CONDUIT, 2 1/C#6& 1 1/C#8**

Description: This work will consist of furnishing and installing electric cable that is triplexed. The cable must be rated at 600 volts and must consist of two number 6 conductors and one number 8 conductor. The cable will be installed in conduit underground.

Material: The cable must meet all requirements of Material Specification 1534 of the Bureau of Electricity, City of Chicago.

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-existant 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.

The cable installation must be color coded so that each lead of all circuits may be easily identified and lighting units connected to the proper leg as indicated on the plans. The equipment grounding conductor (no. 8) must be color coded green.

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 three 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.

Method of Measurement: The length of triplex 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.

Basis of Payment: This work shall be paid for at the contract unit price per lineal foot for TRIPLEX CABLE IN CONDUIT, 2 1/C#6& 1 1/C#8. The 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 SPECIFICATION
1534

ITEM 196 - ****** - SERVICE CONNECTION TO CECO LINE**

Description: This work will consist of providing a service connection from City cable to a Commonwealth Edison secondary cable. For an aerial service, this will be on a wood pole. For an underground service, this will be in a CECO manhole.

Installation: This work will consist of splicing or terminating City service cable to a Commonwealth Edison secondary cable, as directed by the Engineer. The contractor must obtain permission from Edison for the service at the required location. The contractor will inform Edison of the load required. Edison will make the connections, unless Edison gives the contractor permission to make the connections. Any costs associated with the connection will be borne by the contractor.

Method of Measurement: The service connection will be counted as one unit, and will include all labor and material needed to make a successful service connection.

Basis of Payment: This work will be paid for at the contract unit price for each SERVICE CONNECTION, which payment will be in full for providing all material and labor to make the necessary connections.

DRAWING
11925

ITEM 197 - ****** - SIGNAL HEAD, POLYCARBONATE, LED, 3-SECTION, BRACKET MOUNTED**
ITEM 198 - ****** - SIGNAL HEAD, POLYCARBONATE, LED, 5-SECTION, BRACKET MOUNTED**
ITEM 199 - ****** - SIGNAL HEAD, POLYCARBONATE, LED, BIKE, 1-FACE, 3-SECTION, BRACKET MOUNTED**

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.

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.

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

Method of Measurement: This work will be measured per each unit installed, complete.

Basis of Payment: This work will be paid for at the contract unit price for each ASIGNAL 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	DRAWING
1475	834 12268a
1493	835 740
1495	741

ITEM 200 - ****** - SIGNAL HEAD, POLYCARBONATE, LED, 3-SECTION, MAST ARM MOUNTED**
ITEM 201 - ****** - SIGNAL HEAD, POLYCARBONATE, LED, 5-SECTION, MAST ARM MOUNTED**
ITEM 202 - ****** - SIGNAL HEAD, POLYCARBONATE, LED, BIKE, 1-FACE, 3-SECTION, MAST ARM MOUNTED**

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.

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.

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.

Method of Measurement: This work will be measured per each signal unit installed, completely wired and operational.

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		

ITEM 203 - ****** - PEDESTRIAN SIGNAL HEAD, POLYCARBONATE, LED, COUNTDOWN, BRACKET MOUNTED**

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.

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.

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

Method of Measurement: This work will be measured per each signal unit installed, completely wired and operational.

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		DRAWING	
1494	1545	12268-A	
1495		740	834
1475		741	835

ITEM 204 - ****** - ACCESSIBLE PEDESTRIAN SIGNAL**

Revised: 5/25/2019

Description: This work shall consist of furnishing and installing an accessible pedestrian signal (APS) to be mounted on a traffic signal pole or post.

Material: The APS must meet the requirements of Material Specification 1617. Cable for the APS must meet the requirements of Material Specification 1618.

Installation: The location of the APS shall be as shown on the plans or as directed by the Engineer and shall meet the requirements of the MUTCD Chapter 4, Sections 4E.08 to 4E.10.

The power supply shall be installed in the associated WALK/DONT WALK signal head compartment and be securely attached. The input wires to the power supply must be terminated to the correct terminals in the signal head. The output wires of the power supply shall be connected to the APS cable with quick disconnect plugs. The APS cable shall be properly terminated at the APS.

The APS cable is the four-conductor cable that will connect the power supply to the APS. The cable length will vary depending upon the relative location of the APS to its associated WALK/DONT WALK signal head. Care must be taken to ensure the correct wires are connected to the correct terminals. In all cases, the white wire will be the neutral and the green wire will be the ground. The cable should have sufficient slack so that there is no tension in the cable and there is enough extra cable to make or break connections easily. If the cable goes through a manhole/handhole, it must be trained along the sides.

The APS shall be located as indicated on the plans. A three-quarter inch (3/4”) to one inch (1”) diameter hole must be drilled into the pole at the proper height for the cable entrance. The size of the hole will be as directed by the Engineer. The hole must be reamed or filed to remove all sharp edges or burrs which might damage the cable. A weatherproof flexible caulking must be applied between the hole in the pole and the APS housing to protect the cable. The APS bracket shall be attached to the pole with 3/4" steel banding or with two stainless steel screws. The APS shall be attached to the bracket with two stainless steel screws. The height of the push-button shall be 42" above the sidewalk grade where the pedestrian will be located when at the APS, according to ADA requirements. The front face of the APS shall be parallel to the associated crosswalk. The tactile arrow shall be positioned to point toward the crosswalk.

The APS shall be programmed following the manufacturer's instructions. The sound levels and any vocal messages must be programmed as indicated on the plans or as directed by the Engineer.

A sign shall be mounted to the back-plate of the APS. The sign size and message shall be as indicated on the plans or as directed by the Engineer.

Method of Measurement: This work shall be measured per unit for each APS installed. This shall include the installation of the power supply, the installation of the APS, all wiring, providing and installing the sign, all programming, and any other necessary items and labor necessary to make the APS operational.

Basis of Payment: This work shall be paid for at the contract unit price each for ACCESSIBLE PEDESTRIAN SIGNAL of the type specified, which price will be payment in full for furnishing and installing the unit complete and operational.

MATERIAL SPECIFICATION
1617
1618

ITEM 205 - ****** - JUNCTION BOX, POLE OR POST MOUNTED**

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.

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.

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.

Method of Measurement: This work will be measured per each junction box unit installed, complete with elbow(s).

Basis of Payment: This work will be paid for at the contract unit price each for a JUNCTION BOX, POLE OR POST MOUNTED, 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	DRAWING	
1407	954	834
	11984	

ITEM 206 - ****** - PEDESTRIAN PUSH BUTTON POST**

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".

Material: 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.

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 ½" 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.

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.

Basis of Payment: This work will be paid for at the contract unit price each for a PEDESTRIAN PUSH BUTTON POST, which will be payment in full for furnishing and installing the post complete in place.

MATERIAL SPECIFICATION	DRAWING
1462	963

ITEM 207 - ****** - MAST ARM, TRAFFIC, STEEL, MONOTUBE, 20 FOOT**
ITEM 208 - ****** - MAST ARM, TRAFFIC, STEEL, MONOTUBE, 26 FOOT**
ITEM 209 - ****** - MAST ARM, TRAFFIC, STEEL, MONOTUBE, 30 FOOT**
ITEM 210 - ****** - MAST ARM, TRAFFIC, STEEL, MONOTUBE, 35 FOOT**
ITEM 211 - ****** - MAST ARM, TRAFFIC, STEEL, MONOTUBE, 40 FOOT**

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

Material: The mast arm must be 7gauge steel meeting the requirements of Standard Drawing 870 and Material Specification 1454.

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 capmust 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.

Method of Measurement: This work will be measured per each monotube arm installed on a traffic pole.

Basis of Payment: This work will be paid for at the contract unit price for each MAST ARM, TRAFFIC, 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 SPECIFICATION	DRAWING
1454	870
	834

ITEM 212 - ******** - MAST ARM, STEEL, 8 FOOT WITH POLE PLATE

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.

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.

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.

Method of Measurement: This work will be measured per each unit installed.

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	DRAWING
1450	620 659 661
	839
	840
	724

ITEM 213 - ****** - ELECTRIC CABLE IN CONDUIT, #14, 2/C, SHIELDED**

Description: This work will consist of furnishing and installing a shielded lead-in cable for a traffic loop detector or for a pedestrian push button.

Material: The cable must be rated 600 Volts, 90º Centigrade wet and dry. The cable will have soft annealed tinned copper conductors with a PVC insulation and a PVC jacket overall with an appropriate shield. The cable will be equal to that manufactured by Belden, for instrumentation/ process control tray cable, Part No. 9343, or an approved equal.

Installation: The contractor will install the detector cable from the existing traffic controller to the manhole/ hand hole or as indicated on the contract plan drawing. The contractor must splice the cable to the detector loop cable in the manhole or handhole. The other end of the cable must be terminated at the controller. For pedestrian push buttons the cable will be installed from the traffic controller to the push button, without splices or terminations in between.

Method of Measurement: The cable will be measured per lineal horizontal foot from the location of the controller to the handhole or manhole of the splice, or to the push button pole or post location, whichever applies. Additional footage may be added for slack. Five feet of slack will be allowed for each handhole and ten feet of slack will be allowed for each manhole the cable passes through. An additional ten feet may be added at the controller and at the pedestrian pole or post.

Basis of Payment: This work will be paid for at the contract unit price per lineal foot for ELECTRIC CABLE IN CONDUIT, #14, 2/C SHIELDED, which price will be payment in full for furnishing and installing the cable and performing all necessary connections to make the cable operational.

ITEM 214 - ****** - ELECTRIC CABLE IN CONDUIT NO. 14 19/C**
ITEM 215 - ****** - ELECTRIC CABLE IN CONDUIT NO. 4, 2/C**

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.

Traffic Signal Cable: All cable must conform to the requirements of Material Specification number 1537, for Traffic Signal Cable.

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.

Cable Slack: The length of cable slack that must be provided will be in accordance with the following schedule:

Location	Length of Slack Cable (feet)
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.

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.

Basis of Payment: This work will be paid for at the contract unit price per lineal foot for ELECTRIC CABLE IN CONDUIT NO. 14 19/C or ELECTRIC CABLE IN CONDUIT NO. 4, 2/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

ITEM 216 - ****** - REMOVE EXISTING TRAFFIC SIGNAL EQUIPMENT**

Description: This work will consist of removing all the existing traffic signal equipment at the intersections listed on the plans.

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 Division of Electrical Operations (DEO) yard at 2451 South Ashland Avenue, or as directed by the Engineer. 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.

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.

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.

ITEM 217 - ****** - HARNESS CABLE, #16, 8/C**

Description: This item will consist of furnishing and installing cable in traffic signal poles to connect traffic signals or illuminated signs to a junction box on the pole.

Material: The cable must meet the requirements of Material Specification 1475.

Installation: The contractor must install the cable from the required signal or sign terminal strip through the pole and mast arm to the terminal strip in the junction box. The contractor must properly terminate the cable at the terminal strips as directed by the Engineer. Sufficient cable will be provided so as not to unduly strain the cable during installation, and to provide sufficient cable for easy termination.

Method of Measurement: This work will be measured per lineal foot of cable installed. Cable terminations will be considered incidental to this pay item.

Basis of Payment: This work will be paid for at the contract unit price per lineal foot for HARNESS CABLE, #16, 8/C, which payment will be in full for furnishing and installing the cable.

ITEM 218 - ****** - CABLE, T.S., AERIAL, TEMP.**

Description: This item will consist of furnishing and installing cable on traffic signal poles to temporarily connect traffic signals or illuminated signs to the controller.

Material: The cable must meet the requirements of Material Specification 1475.

Installation: The contractor will install the cable from the locations indicated by the Engineer or as shown on the plans, on the outside of the poles, aerially from one location to the next. The cable will be hung from the poles without damaging the poles by methods approved by the Engineer. If cable is to be run to the controller, a conduit riser with weatherhead must be provided for cable entry. The contractor must properly terminate the cable at the terminal strips, or as directed by the Engineer. Sufficient cable must be provided so as not to unduly strain the cable during installation, and to provide sufficient cable for easy termination.

Method of Measurement: This work will be measured per lineal foot of cable installed. Cable terminations, and hanging of the cable from the poles will be considered incidental to this pay item.

Basis of Payment: This work will be paid for at the contract unit price per lineal foot for CABLE, T.S., TEMP. AERIAL, which payment will be in full for furnishing and installing the cable.

ITEM 219 - ****** - CONTROLLER, STREET LIGHT, BASE MOUNTED, 1 PHASE , 200 AMP**

Revised: October 31, 2021

Description: This work will consist of furnishing and installing an aluminum cabinet to be mounted on a ballast housing base, and containing various electro-mechanical devices to automatically control street lighting circuits, and to provide protection for the equipment so controlled.

The controller specified will be equated to the service capability of the Commonwealth Edison Company at the given location and to the number of circuits to be serviced as required by the plans.

Material and Assembly: The aluminum controller cabinet and electro-mechanical control devices must meet the requirements of Material Specification 1497.

The electro-mechanical devices within the cabinet must be attached to a 3/8 inch thick phenolic, linen base, bakelite panel drilled to accommodate the various devices with allowable clearances, and secured in the cabinet with 5/16" - 18 NC x 7/8" stainless steel machine screws, as per Drawing 887(3-phase, 100amp), 883(3-phase, 200amp), 884(1 phase, 100amp), or 886(1-phase,200amp).

The circuit breakers, single-pole, two-pole, or three-pole must meet the requirements of Material Specification 1428. The remote control contactor must be as indicated on the referenced drawings.

Installation: The controller must be wired as shown on Drawing 862(100 or 200 amp, 1-phase, with 120 volt photocell), 863(100 amp, 1-phase, with 240 volt photocell), or 864(100 or 200 amp, 3-phase). For a 100 ampere controller the main circuit breaker and the contactor must each have a 100 ampere rating, and the branch circuit breakers must be as indicated on the plans. For a 200 ampere controller the main circuit breaker and the contactor must each have a 200 ampere rating, and the branch circuit breakers must be as indicated on the plans. For a three phase service, a three pole main circuit breaker and three pole contactor of the corresponding ampere rating must be installed and the branch circuit breaker ampere ratings must be as indicated on the plans.

For grounding the cabinet, a bare copper wire, #4 AWG, must be attached from the ground lug in the cabinet to the grounding clamp on the ground rod.

The cabinet must be installed on a ballast housing base, 20 inches in height secured to a concrete foundation as shown on Drawing 876(110 amp) or 880(200 amp), at the location indicated on the plans. The ballast housing base must meet the requirements of Material Specification 1375. The ballast housing must be part of this pay item. The foundation, including anchor rods, washers, and nuts will be a separate pay item.

The installation of feeder cables and branch circuit cables will be performed in a neat and workmanlike manner with all cable trained around the cabinet, secured to the proper terminals and identified either by tagging of the cables, or by identification of the branch breakers, all as part of the controller installation and not as a separate pay item.

The lighting circuit will be placed in operation as soon as practicable with the Contractor being charged for the energy until the circuits are accepted by the City of Chicago, Bureau of Electricity.

Basis of Payment: This work will be charged for at the contract unit price each for a CONTROLLER, STREET LIGHT, BASE MOUNTED of the proper phase and amperage, and will be payment in full for furnishing and installing the controller complete in place.

MATERIAL SPECIFICATION	DRAWING
1428	736 785 862 863 864
1375	876 880 883 884 886
1497	887

DS - 160

ITEM 220 - ****** - SIGN, SYMBOLIC NRT, LED ILLUMINATED, BRACKET MOUNTED**

Description: This item will consist of furnishing and installing a single faced, illuminated, LED sign, either bracket mounted on a street light or traffic signal pole, or on a traffic post, or mounted on an overhead traffic signal arm, at the location shown on the plans or as authorized by the Engineer. The sign will be symbolic meeting the requirements of the MUTCD, as required in the plans or as directed by the Engineer.

Material: The sign must meet the requirements of Material Specification 1518 for the particular sign specified. The mounting brackets must meet Material Specification 1463 for mast arm mounted signs. Signs mounted to the sides of poles must be mounted using 1.5" galvanized rigid steel pipe and associated fittings. The cable must meet the applicable requirements of Material Specification 1475.

Installation: Each sign must be faced in the direction of the traffic it is intended to control. During construction and until the installation is placed in operation, the sign face must be hooded. The hooding material must be securely fastened so it will not be disturbed by inclement weather or wind. The signs will be mounted as shown on Standard Drawing 834 and 835.

The bracket mounted sign 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 must have a baked-on black finish. The mounting configuration connecting the sign to the mounting bracket must consist of sections of 1 1/2" rigid steel conduit of precise lengths as indicated on the standard drawing to create the designated structure. When the sign is to be mounted on a square pole or flat surface, the bracket will be bolted to the flat pole or surface using 3/8" drive studs where permissible or using 3/8" studs in tapped holes. 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 sign face at a standard height of fourteen feet and eight inches (14' 8"), 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 sign is in operation.

The mast arm mounted sign must be mounted using a bracket specifically designed for the purpose. The bracket must be banded to the mast arm using two strips of 3/4" stainless steel banding, single wrapped, each secured with a stainless steel banding clip. The banding and clips must have a baked-on black finish. A one inch (1") diameter hole must be drilled in the mast arm to accept the cable. The hole must be reamed or filed to provide a smooth surface, so as not to damage the cable during installation or under normal weather conditions or from vibrations.

The Contractor must provide and install the flexible electrical harness cable. The cable must be of sufficient length to extend without strain or stress from the sign head to the terminal strip in the junction box mounted on the pole.

The harness cable from the sign must enter the pole or mast arm 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.

The pole mounting bracket, and the crosses are to be factory painted by the manufacturer with

baked on black enamel.

Method of Measurement: This work will be measured per each unit installed, completely wired and operational.

Basis of Payment: This work will be paid for at the contract unit price for each SIGN, SYMBOLIC, LED ILLUMINATED, BRACKET MOUNTED or MAST ARM MOUNTED, with the symbol specified, which price will be payment in full for furnishing and installing the sign complete.

MATERIAL SPECIFICATION	DRAWINGS
1463	834
1475	835
1518	12268A

ITEM 221 - ****** - ATC CONTROLLER, TRAFFIC, 16 LOAD BAY, "SUPER P" CABINET, UPS**

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.

Material: The material must meet the requirements of Material Specification 1560, "Advanced Transportation Controller and Cabinet with Uninterruptible Power Supply". The cabinet will be a Super P cabinet 16 load bays. Each load bay must include a load switch. A battery powered uninterruptible power supply (UPS) system must be included. Communications interface equipment, if required, will be included under a separate item.

Procurement: The contractor must provide Request for Inspection of Material forms for traffic signal controllers and cabinets as requested for specific projects. The Division of Electrical Operations will review and comment on the submitted material. The Division of Electrical Operations will approve the purchase of the material from a supplier. Final material approval will be made in accordance with Chicago Department of Transportation specifications. The Contractor must provide proof of purchase to the Resident Engineer within seven (7) days following approval by the Division of Electrical Operations. 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 Division of Electrical Operations 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 Division of Electrical Operations 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 Division's facilities. Within forty-eight (48) hours of notification, the Contractor must pick-up the controllers and cabinets from the Division. The controllers and cabinets will be stored at a facility, approved by the Commissioner, at the contractor's expense.

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 time coordination 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.

Division of Electrical Operations and Division of Safety personnel from the Chicago Department of Transportation 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.

Basis of Payment: This work will be paid for at the contract unit price for each ATC CONTROLLER, TRAFFIC, 16 LOAD BAY, "SUPER P", UPS, which price will be payment in full for furnishing and installing the controller complete and operational, with all wiring and connections as specified.

ITEM 222 - ****** - INTERSECTION TECHNOLOGY ENHANCEMENTS**
ITEM 223 - ****** - 360 DEGREE DETECTION CAMERA**

Description: This work consists of furnishing, installing, integration, and testing a set of environmentally hardened communications node equipment at a signalized intersection. The set of equipment shall include 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 local area network connectivity for equipment in the cabinet, interface with the City's central signal system, and provide forward compatibility with future ITS systems such as connected vehicles and adaptive signals. The integration device shall be physically located in a traffic signal control cabinet.

GENERAL REQUIREMENTS

1. The intersection technology enhancements shall have web portal interface and intersection communications node. The intersection communications node shall include multiple backhaul communications options including Ethernet over hardwired copper or fiber cabling and cellular communications backhaul. The node shall support full control of the intersection hardware including the remote management and control of the traffic signal controller.

2. Fiber backhaul requires coordination with the Chicago Office of Emergency Management and Communications (OEMC) to complete an end-to-end communications link between field device locations and the Chicago Traffic Management Center (TMC).

3. Cellular backhaul connections shown on the plans requires service coordination with City to complete an end-to-end, broadband cellular communications link between field devices and the Chicago TMC. The cellular modem may be a separate unit or integrated into the intersection communications node. In either case, the cellular modem, cellular service utilizing an existing City contract with a mobile service provider, installation, and coordination requirements shall be as required in the special provision for Cellular Modem. Contractor shall provision the modem on the City's cellular provider's private network, with the SIM card and IP address provided by City. Cellular service shall be included for three years. Cellular service costs will be paid by City after the initial three years.

4. The communications node shall be provided with all required components, including power supply, cables, mounting hardware, and all accessories required to make the system fully operational in accordance with these specifications. The camera shall be mounted at a height that allows full visibility of the intersection as required to achieve the performance requirements of this special provision. If additional cameras, mounting arms, or cabling are required to achieve the detection accuracy requirements specified herein, they shall be furnished and installed at no additional cost beyond the original bid price.

5. Shall be forward compatible to support connected vehicles technologies including but not limited to Dedicated Short Range Communications (DSRC).

6. Final equipment selection, procurement, and provisioning shall be coordinated with CDOT.

7. Identical and completely interchangeable equipment shall be used at each field location.

8. All equipment shall include the manufacturer's installation and operations manuals in hardcopy and electronic PDF formats.

9. Contractor shall provide documentation of exact equipment model and serial numbers in hardcopy and electronic PDF formats.

MATERIAL REQUIREMENTS

1. **GENERAL**

1.1 Specifications: The intersection technology equipment shall conform in detail to the requirements herein stated and to the latest referenced specifications of the National Electrical Manufacturers Association (NEMA), Federal Communications Commission (FCC), and Restriction of Hazardous Substances (RoHS).

1.2 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.

1.3 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 sample shall be delivered to the Division of Electrical Operations, 2451 South Ashland Avenue, Chicago, Illinois 60608.

1.4 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. Legacy traffic signal controller interface. To enable interfacing with the City's legacy traffic signal controllers that do not have a capable communications port, an interface hardware adapter shall be included with the technology enhancement equipment.

3. Future technology. The technology enhancement equipment shall be forward compatible to support connected vehicles technologies including Dedicated Short-Range Communications (DSRC) and adaptive traffic signal controls.

4. Identical and completely interchangeable equipment shall be used at each field location.

1.5 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.

1.6 Warranty:

1. 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 warranty shall include software updates and a 24 hour/7 day a week phone support. The manufacturer's local distributor shall provide a replacement of any failed technology enhancement equipment at no cost to the City.

2. Written warranty and other applicable documents from the manufacturer, and a copy of the invoice showing the date of shipment, shall be provided to the Engineer prior to final written acceptance.

3. All technology enhancement equipment shall include a standard manufacturer's warranty, transferable to CDOT. Transfer shall be completed prior to final written acceptance.

1.7 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 final acceptance.

2. The software license shall be fully transferable to CDOT. Transfer shall be completed prior to final written acceptance.

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.

1.8 Final equipment selection, procurement, and provisioning shall be coordinated with CDOT.

2. ENVIRONMENTAL

2.1 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.

2.2 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.

3. INTEGRATION DEVICE

3.1 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. Cellular service shall be included for a period of three years from the date of the City's final acceptance. Cellular service costs will be paid by City after the initial three years.

3.2 Minimum four Ethernet ports (RJ-45). Minimum one PoE+ port.

1. Support Transmission Control Protocol (TCP)/IP and User Datagram Protocol (UDP).
2. Include network cables that are Electronic Industries Alliance (EIA)/Telecommunications Industry Association (TIA)-568-A complaint.

3.3 Minimum four serial ports (RS-232). Minimum one RS-485 port.

3.4 Minimum two Universal Serial Bus (USB) ports (USB 2.0 or higher).

3.5 Minimum four Input/Output (I/O) pins. One 24 VDC supply pin.

3.6 Frequency band and cellular network interface shall be fully compatible with the City's cellular data service provider as specified in the Cellular Modem specification.

3.7 Shall support 4G LTE cellular connectivity with MiMo and diversity (Bands 2, 4, 5, 13, 17, 25), HSPA+, GSM/GPRS/EDGE, EV-DO Rev A, 1XRTT with peak downlink of 100Mbps and peak uplink of 50Mbps.

3.8 Shall support 802.11 a/b/g/n with MiMo and Diversity antennas with security of at least 64/128 bits WEP, WPA, WPA2.

3.9 Shall support GPS.

3.10 Shall support communication of Telemetry Data, Video Data, Alert Data, and Vehicle Identification Data to the Server via the Communication Service.

3.11 Management, Security and Diagnostic

1. Support real-time 2-way communications for remote management and shall include management software by the integration device equipment manufacturer.
2. Light-emitting diode (LED) indicators for network connectivity, power, and status.
3. Compatibility with Hypertext Transfer Protocol (HTTP)/HTTP Secure (HTTPS), Secure Socket Layer (SSL).
4. Web-based Graphical User Interface (GUI).

3.12 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. Cable shall be shielded with stranded conductor and jacket meeting UL 2556d
4. Communicate to the controller over TCP/IP
5. Support communication over SNMP v1, v2c, and v3 protocols
6. Support communication 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 between detector, pedestrian detection and pre-emption device information from all detectors, pedestrian detectors 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. Support controller clock re-syncing
19. Support placing a call on a phase if a detector is in fault
20. Support running 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'

3.13 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 1 millisecond resolution between detection events
6. Detect detector failure in either always high, or always low, mode
7. Support placing a detector call if a different detector is in fault
8. Support capturing and reporting controller faults based on MMU status bits of 'in conflict', 'red failure', 'diagnostic failure', 'in failure state', and 'local flash'

4. CELLULAR ANTENNA

4.1 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.

4.2 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 inch from the cabinet. It shall be mounted to the back of the cabinet using a drilled hole to allow cables to pass through. 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.

4.3 For the cellular modem integrated in the integration device, the antenna shall have with multiple antennas inside with one threaded opening for all cabling and shall support:

1. Dedicated Short Range Communications (DSRC) 5.9 GHz (qty: 1)
2. Global Positioning System (GPS) (qty: 1)
3. 3G/LTE MIMO (qty: 2)
4. 2.4GHz/5GHz WiFi MIMO (qty: 2)

4.4 Include antenna cables with required manufacturer-terminated connectors for full compatibility with corresponding ports on the integration device.

4.5 Shall have labeled antenna terminations for easy installation.

4.6 Shall not exceed 1-1/2 inch in height.

4.7 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.

5. **POWER**

Technology enhancement equipment inside the traffic signal controller cabinet shall meet the following power requirements.

5.1 Include compatible power supply and connections as recommended by the technology enhancement equipment manufacturer.

5.2 Shall support power source via NEMA 5-15R or direct-wire terminal block.

6. **SOFTWARE**

6.1 Web-based management software by equipment manufacturer with Graphical User Interface (GUI) and secured through Secure Sockets Layer (SSL) encryption.

6.2 User authentication through login credentials.

6.3 Shall support an unlimited number of concurrent logins by authenticated users.

6.4 Shall be fully accessible via desktop, tablet, and mobile products on Chrome, Microsoft Edge and Safari.

6.5 Security:

1. User authentication through login credentials
2. Account verification through email
3. Password reset
4. Administrative management of user profiles and customizable privileges

6.6 Shall support live display of all Telemetry Data with latency not to exceed 1 second.

6.7 Shall support historical display of all Telemetry Data on-demand with load latency not to exceed 1 second.

6.8 Shall support a viewing mode in which all Telemetry Data is displayed overlaid onto a diagram of the intersection.

6.9 Shall support live video streaming from the Camera to desktop browsers without any third-party plugins.

6.10 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.

6.11 Shall support display of environmental weather conditions, including precipitation and temperature, as part of live and historical viewing of Telemetry Data.

6.12 Shall provide reporting on signal telemetry, detector and alert data.

6.13 Users shall receive signal performance measures including:

1. Shall support generation of approach volume charts when the intersection includes upstream detector data
2. Shall support generation of arrivals-on-red / arrivals-on-green charts when the intersection includes upstream detector data
3. Shall support generation of Purdue Split Failure chart when the intersection includes stop-bar detector data
4. Shall support generation of Purdue Split Failure trends when the intersection includes stop-bar detector data
5. Shall support generation of detector occupancy ratio charts (Red, Green, and ROR5) for all intersection movements that include stop-bar detector data
6. Shall support generation of phase green allocation over any 24 hour period viii. shall support generation of Purdue Coordination Diagram when the intersection includes upstream detector data
7. Shall support generation of simple delay charts for all intersection movements that include stop-bar detector data
8. Shall support download of all above mentioned signal performance charts as flat image files, PDF files, CSV, or XLS files

6.14 Users shall be able to replay historical signal events for up to 3 months.

6.15 Data summaries:

1. User-selectable metrics from all monitored turning movement count data
2. Access to current and historical data
3. User-selectable summary graphs and data tables
4. Exportable data summary formats, including Portable Document Format (pdf) and Comma-Separated Values (csv)

6.16 Video:

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. Maximum initial load time of 10 seconds
4. Maximum latency of 10 seconds at minimum frame rate of 15 fps
5. Minimum 20 concurrent video streams per camera
6. Support a minimum of 40 total simultaneous video streams among all cameras
7. Users shall be able to configure the detection zones over the web portal
8. The portal shall have the capability to recall, download, and view intersection video recorded and stored at the intersection for up to 7 days
9. Shall support live video streaming of any third-party camera connected over ethernet to the Peripheral Interface Hardware that supports non-proprietary codecs and RTSP streaming

10. Shall support live video streaming with an initial load time of no more than 10 seconds
11. Shall support live video streaming with a latency of no more than 10 seconds at a frame rate of at least 15 fps
12. Shall support at least 10 concurrent video streams from a single camera to be viewed in multiple browsers

6.17 External data interface:

1. Support external data access by shared open protocol or documented network-based Application Programming Interface (API)
2. Open data interface format including JSON and XML
3. Support administrative management and security of data interface

6.18 Multimodal Safety Analytics:

1. Shall support generation of Red Light Running data charts for any intersection approach and movement with a protected phase over any 24 hour period
2. Shall visualize the individual occurrences of Yellow and Red light actuations with hoverable timestamps
3. Shall include an hourly Red Light Runner count to summarize the individual occurrences
4. Shall support generation of Pedestrian Compliance data charts for any configured crosswalk side with a pedestrian phase over any 24 hour period
5. Shall visualize the individual occurrences of crossing on Flashing Don't Walk (FDW) and Don't Walk (DW) with hoverable timestamps
6. Shall include an hourly Rate of Compliance summarizing the ratio of Non-Compliant pedestrian crossings

7. 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.

CONSTRUCTION

1. General

a) Installation shall be done in accordance with manufacturer recommendations.

b) Contractor shall securely mount the intersection communications node equipment inside the signal cabinet in designated locations as shown on the plans.

c) Cabling length shall remain within required Ethernet and serial communications limits. Cable slack shall be provided at pull points and at the cabinet for maintenance access of equipment.

d) If an integrated cellular modem is used, the Contractor shall perform the

associated survey and installation work as specified in the Cellular Modem special provision. Contractor shall neatly route and secure all cabling with the cabinet.

e) Contractor shall configure the communications node equipment with enabled security and interoperability with the existing City network as directed by the Engineer, including VPN settings and local IP address. Administrative account login credentials shall be provided to the Engineer.

f) Contractor shall provide field troubleshooting support during integration and testing by CDOT Advanced Traffic Management System (ATMS) administrator.

2. Submittals

a) Contractor shall submit for approval to the Engineer within 15 business days from Notice To Proceed, a submittal schedule that describes each submittal and planned date of submission.

b) Contractor shall make all submissions to the Engineer in hardcopy and electronic PDF format.

c) Contractor shall obtain approval of the schedule, catalog cut sheets, installation diagrams, test plans, and calculations from the Engineer prior to purchasing any equipment and subsequently performing the installation per the approved documents, contract plans, and specifications.

3. Integration

a) Systems Integration of the Intersection Technology Elements into the City's Advanced Traffic Management System (ATMS) will be led by the City's Systems Integrator (currently Parsons). Contractor shall provide field troubleshooting support during integration and testing by ATMS administrator.

b) The system shall support communication and integration with City's central signal system (currently EcoTrafix from Kapsch). The communication should support full control of the signal controller from the central signal system.

c) Contractor shall develop a Device Integration Plan (DIP) and submit it to the Engineer for approval at least 14 days prior to field installation. Equipment shop drawing approvals shall be obtained prior to submitting the DIP.

d) The Contractor shall contact the equipment manufacturer and the CDOT ATMS administrator to facilitate the sharing of device information. Contractor shall obtain recommendations and support services from these parties and incorporate them into the DIP.

e) Contractor shall set up a bench test if recommended by the equipment manufacturer or CDOT ATMS administrator. Configuration support is to be provided by the equipment manufacturer and CDOT ATMS administrator as obtain by the Contractor. Location of the bench test shall be proposed by the

Contractor for approval by the Engineer.

f) Contractor shall coordinate with CDOT Division of Electrical Operations (DEO) for all work affecting existing city infrastructure and equipment.

g) The DIP shall include the following:

i. Updated communications node locations and layouts inside cabinets
ii. Current device communications interconnect schematics
iii. Proposed technical steps for integration and validation
iv. Configuration settings for each communications interface for each equipment

h) Support from the equipment manufacturer shall include on-site installation guidance, equipment configuration settings, and troubleshooting. Physical installation work shall be performed by the Contractor.

i) Support from the CDOT ATMS administrator shall include modifications and software programming necessary to integrate the data from the intersection communications node equipment.

j) Contractor shall provide field support for equipment at the intersection and shall coordinate with the CDOT traffic signal management software vendor (Currently Kapsch) and the CDOT ATMS administrator to assist with integration.

4. Acceptance Testing

a) Contractor shall develop an Acceptance Test Plan (ATP) and submit it to the Engineer for approval. The Contractor shall obtain the recommendations from the equipment manufacturer and CDOT ATMS administrator and incorporate them in the ATP.

b) The ATP shall document detailed steps to verify each required functional performance of the equipment.

c) The ATP shall include checklists for each test. Each checklist item shall have defined pass/fail criteria with a reserved space to record the results.

d) Corrective actions shall be documented in detail on checklist forms.

e) Testing shall be witnessed by representatives of the Contractor and the Engineer.

f) Each checklist shall include areas for signatures by representatives of the Contractor's representative and the Engineer's representative. Completed checklists shall be provided to the Engineer in hardcopy and electronic PDF formats.

g) The ATP shall include three levels of testing:

i. Local – Verification that each individual equipment of the intersection communications node is installed and functioning properly
ii. Subsystem – Verification that connected field devices are properly communicating with the intersection communications node
iii. System – Verification that the connected field devices are properly configured and communicating with the Chicago ATMS central management software through the intersection communications node equipment

h) The Contractor shall submit to the Engineer a proposed schedule for conducting the approved ATP.

i) The Contractor shall conduct pre-testing to confirm equipment readiness before the formal acceptance testing takes place.

j) After all levels of testing are successfully completed and accepted by the Engineer, there shall be a 60-day burn-in period to verify the continuous and stable operation of the intersection communications node and continued achievement of accuracy requirements.

i. The Contractor shall document all failures, including description, date, time, and location of each occurrence. The written documentation shall be provided to the Engineer.
ii. Major failures shall require the restarting of the 60-day burn-in period following the correction of the issue. Major failures shall include those that involve more than 48 hours to resolve the issue or frequent recurrence of minor failures as determined by the Engineer.
iii. Minor failures shall require the pausing of the 60-day burn-in period until the issue is resolved; then resuming the 60-day burn-in period.

Method of Measurement: The INTERSECTION TECHNOLOGY ENHANCEMENTS will be measured per each for each intersection where Intersection Technology Enhancements are installed, complete. The 360 DEGREE DETECTION CAMERA will be measure per each.

Basis of Payment: The work by the Contractor will be paid for at the contract price, each, for INTERSECTION TECHNOLOGY ENHANCEMENTS, and 360 DEGREE DETECTION CAMBERA which price will be payment in full for furnishing and installing the communications node equipment complete and fully operational for three years with all necessary cables, modems, hardware, accessories, components, coordination with and payments to cellular service provider as applicable, with all wiring and connections as specified herein.

ITEM 224 - ****** - MAINTENANCE OF EXISTING TRAFFIC SIGNAL INSTALLATION**

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.

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.

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.

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.

ITEM 225 - ****** - REMOVE WIRE RACK**
ITEM 226 - ****** - REMOVE AERIAL CABLE, SS 3/C#4**
ITEM 227 - ****** - REMOVE SERVICE CABLE IN CONDUIT 2 #1/0**
ITEM 228 - ****** - REMOVE BRANCH WIRES, 2 #6**
ITEM 229 - ****** - REMOVE CABLE IN CONDUIT, 7,10,14,19,22 C**
ITEM 230 - ****** - REMOVE HARNESS CABLE, 8C**
ITEM 231 - ****** - REMOVE SERVICE CABLE IN CONDUIT, 2/C**
ITEM 232 - ****** - REMOVE RISER ON EMBEDDED POLE 1 ¼", 2"**
ITEM 233 - ****** - REMOVE SERVICE CABLE IN CONDUIT 3 #2**

Description: This work will consist of the removal and disposal of existing electrical equipment including, but not limited to, ballast bases, risers, racks, cross arms, cable, truss arms, and clamps as specified on the plans or as directed by the Engineer.

General Requirements: Electrical equipment to be removed must be disassembled as required for the complete removal of the item from the work site. Removal must include all incidental work and items associated with the electrical equipment as directed by the Engineer.

Method of Measurement: Electrical equipment to be removed will be measured for payment by each unit removed, with the exception of cable. Cable will be measured by the foot. Cable to be removed must be measured by horizontal distances only from point to point, and will not include slack, sag, or other vertical dimensions.

Basis of Payment: Electrical equipment removal will be paid for at the contract unit price for each unit removed, which price will be payment in full for all labor, equipment, materials, and incidental work necessary for the complete removal, transport, disposal, and disposal fees to complete the work as specified. Cable will be paid for at the contract unit price per foot, which price will be payment in full for all labor, equipment, materials, and incidental work necessary for the complete removal, transport, disposal, and disposal fees to complete the work as specified.

ITEM 234 - ****** - REMOVE POLE, STEEL, AB, 10", 7 GA, 34'6"**
ITEM 235 - ****** - REMOVE POLE, STEEL, AB, 10", 3 GA, 34'6"**
ITEM 236 - ****** - REMOVE POLE, STEEL, AB, 11", 3 GA, 34'6"**
ITEM 237 ****** - REMOVE POLE MOUNTED STREET LIGHT CONTROLLER**
ITEM 238 - ****** - REMOVE TS HEAD, 1 – FACE**
ITEM 239 - ****** - REMOVE PED. SIGNAL HEAD**
ITEM 240 - ****** - REMOVE MONOTUBE M.A. 20'**
ITEM 241 - ****** - REMOVE MONOTUBE M.A. 26'**
ITEM 242 - ****** - REMOVE MONOTUBE M.A. 30'**
ITEM 243 - ****** - REMOVE MONOTUBE M.A. 40'**
ITEM 244 - ****** - REMOVE TS POST, 15', 17',**
ITEM 245 - ****** - REMOVE CONTROLLER & POST**
ITEM 246 - ****** - REMOVE JUNCTION BOX, TSS 18**
ITEM 247 - ****** - REMOVE LUMINAIRE**
ITEM 248 - ****** - REMOVE MAST ARM STEEL, 12'**
ITEM 249 - ****** - REMOVE CONTROLLER-BASE MOUNTED**

Description: This work will consist of the removal, salvage, and delivery of existing electrical equipment, including but not limited to light poles, arms, luminaires, signs, signals, controllers, and enclosures as specified on the plans or as directed by the Engineer. Salvaged electrical equipment must be delivered to the Bureau of Electricity yard at Cicero and 41st Street or to another City of Chicago location as directed by the Engineer.

General Requirements: Electrical equipment to be removed and salvaged must be disassembled as required for the complete and safe removal and transport of the item from the work site. Electrical equipment must be hoisted, loaded and secured on adequate transport with care to prevent damage. Removal will include all incidental work and items associated with the equipment as directed by the Engineer.

Method of Measurement: Electrical equipment to be removed and salvaged must be measured per each unit removed and salvaged.

Basis of Payment: Electrical equipment removal and salvage will be paid for at the contract unit price for each unit removed and salvaged, which price will be payment in full for all labor, equipment, materials, and incidental work necessary to complete the work as specified.

ITEM 250 - ****** - REMOVE POLE, STEEL, EMBEDDED, 7 GA., 35'**

Description: This work will consist of the removal, salvage, and delivery of existing embedded poles and the restoration of the disturbed area as specified on the plans or as directed by the Engineer. Salvaged poles must be delivered to the Division of Electrical Operations (DEO) yard at 2451 South Ashland Avenue, or as directed by the Engineer.

General Requirements: Electrical poles to be removed must be disassembled as required for the complete and safe removal and transport of the item from the work site. Poles will be hoisted, loaded and secured on adequate transport with care to prevent damage. The area of the pole removal must be restored to like condition of the area surrounding the removed pole. Removal must include all incidental work and items associated with the pole as directed by the Engineer. If a CTA pole cannot be removed, it must be burned off at 18 inches below grade and disposed of in an approved manner as directed by the Engineer. The area must then be restored in an approved manner. The engineer will determine if the pole is salvageable.

Method of Measurement: Electrical poles to be removed will be measured for payment by each unit removed and salvaged.

Basis of Payment: Electrical pole removal and salvage, including site restoration, will be paid for at the contract unit price for each pole, which price will be payment in full for all labor, equipment, materials, and incidental work necessary to remove and salvage the pole and for the restoration of the site as specified. Disposal, if necessary, and disposal fees will be considered incidental and not be paid for separately.

ITEM 251 - ******** - ELECTRICAL SERVICE EQUIPMENT REMOVAL ON CECO POLE

Description: This work will consist of the removal and disposal of existing electrical service equipment, except that the junction box must be salvaged and delivered to the Bureau of Electricity as specified on the plans or as directed by the Engineer. The junction box must be delivered to the Division of Electrical Operations (DEO) yard at 2451 South Ashland Avenue, or as directed by the Engineer. The remainder of the removal shall conform to the requirements of Specification 541.

General Requirements: Electrical service equipment to be removed must be disassembled as required for the complete removal of the item from the work site. Removal will include all incidental work and items associated with the electrical equipment as directed by the Engineer. The junction box to be removed and salvaged must be disconnected from the conduit riser and cables as required for safe removal and transport. The junction box must be handled with care to prevent damage.

Method of Measurement: Electrical service equipment to be removed will be measured for payment by each service unit removed. This will include disconnecting all cable from the disconnect box, the removal of the service entrance cable, removal of the disconnect box, removal of any conduit or other pole attachments, and the salvaging of the disconnect box. Removal of the cable from the disconnect box to the street light or traffic controller will not be included under this item.

Basis of Payment: Electrical service equipment removal will be paid for at the contract unit price for each unit removed, which price will be payment in full for all labor, equipment, materials, and incidental work necessary for the complete removal, transport, disposal, and disposal fees to complete the work as specified. Removal and salvage of the junction box will be considered incidental and not paid for separately.

ITEM 252 - ******** - BREAKDOWN MANHOLE IN PARKWAY

Description: Work under this item will include breaking down an existing handhole or manhole and filling in the affected area to grade.

Demolition: This work will consist of removing the frame and cover of an existing handhole or manhole, breaking down the handhole/manhole walls, removing large debris, and backfilling the hole with screenings or other approved material. Backfill must be installed in 6 inch layers and tamped. If the handhole/manhole is in a parkway, the hole must be filled level to the existing grade. The top six inches of fill must be of an approved soil mixture. If the handhole/manhole is in sidewalk or in pavement, the sidewalk or pavement must be restored under a different pay item. If the frame or cover is deemed re-useable by the Engineer, the frame and/or cover must be delivered to the Bureau of Electricity at a location identified by the Engineer. Any debris, including the frame and cover must be disposed of off-sight in an approved manner. The contractor will pay for all disposal fees.

Method of Measurement: This work will be paid for per each manhole or handhole removed. All backfill will be considered as part of the manhole breakdown.

Basis of Payment: This work will be paid for at the contract unit price per each for BREAKDOWN EXISTING MANHOLE IN PARKWAY, which price will be payment in full for all labor and materials necessary to complete the work as described. Salvaging of the frame and cover will be considered incidental to this item.

ITEM 253 - ****** - BREAKDOWN FOUNDATION, STREET LIGHT**
ITEM 254 - ****** - BREAKDOWN FOUNDATION, TYPE A**
ITEM 255 - ****** - BREAKDOWN FOUNDATION FOR BASE MOUNTED CONTROLLER**

Description: The work will consist of removing a concrete foundation for the specific item referenced. The foundation must be completely removed or broken down to a point three feet below grade, disposing of the debris off-sight in an approved manner, backfilling the excavation with screenings or other approved backfill material, and reconstructing the surface area. If the foundation is in a parkway, the parkway must be properly restored with dirt to the existing level. If the foundation is in sidewalk, the sidewalk must be restored under a different pay item and will not be considered as part of this work. Debris must be disposed of according to Section 202.03 of the Standard Specifications. Backfill must meet the requirements of Section 1003.04 of the Standard Specifications.

Method of Measurement: This work will be measured per each foundation removed, which will also include proper disposal and backfill.

Basis of Payment: This work will be paid for at the contract unit price each for BREAKDOWN FOUNDATION, TYPE A, of the type specified, which price will be payment in full for all labor and materials necessary to complete the work as described above. No additional payment will be made for backfill or disposal of debris.

ITEM 256 - ****** - CHICAGO 2000 LUMINAIRE ARM, 8 FOOT, WITH SCROLL**

Description: This item will consist of furnishing and installing an ornamental luminaire arm with supporting scroll onto an ornamental fluted steel pole, or other pole as directed by the Engineer or as shown on the plans.

Material: The material must meet the requirements of Material Specification 1514 and Standard Drawing 930.

Installation: The arm must be securely mounted to the pole by two bolts supplied under this item. The scroll must be attached to the pole and the arm with brackets as shown on Standard Drawing 930. The scroll will provide support to the arm and luminaire.

The contractor must exercise due caution in erecting the pole and mast arm to minimize any possible damage to the finish. When necessary, and when approved by the Engineer, 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.

Method of Measurement: This item will be measured per each unit installed and must include the arm, scroll, and all necessary hardware to attach the arm and scroll to the pole.

Basis of Payment: This work will be paid for at the contract unit price per each for CHICAGO 2000 LUMINAIRE ARM, 8 FOOT, WITH SCROLL, which payment will be in full for securely attaching the arm and scroll to the pole.

MATERIAL SPECIFICATION	DRAWINGS
1514	930

ITEM 257 - ******** - CHICAGO 2000 POLE BASE

Description: This item will consist of furnishing and installing an ornamental pole base to a steel light pole as directed by the Engineer or as shown on the plans.

Material: The base will be fiberglass meeting the appropriate requirements of Material Specification 1513 and Standard Drawing 930A.

Installation: The base must be installed after the steel pole is erected. The base halves must be set around the pole shaft and secured to each other. The base must be set so that it sits evenly around the pole shaft. The base must be level and plumb so that it appears to be integral with the pole shaft. The base should sit level on the concrete foundation. Set screws will be used to keep the base from shifting about the shaft, and to attach the base to the pole as shown on Standard Drawing 930A.

The contractor must exercise due caution in installing the base to minimize any possible damage to the finish. When necessary, and when approved by the Engineer, the contractor will utilize, at his own expense, factory approved touchup materials and methods to restore the finish to like new appearance and durability.

Method of Measurement: This item will be measured per each unit installed and must include the ornamental base and all necessary hardware to securely install the base on the foundation and around the pole shaft.

Basis of Payment: This work will be paid for at the contract unit price per each for CHICAGO 2000 POLE BASE, which payment will be in full for furnishing and securely installing the ornamental base.

MATERIAL SPECIFICATION	DRAWINGS
1513	930A

ITEM 258 - ****** - LUMINAIRE, LED, TEARDROP, CHICAGO 2000**

Revised: March 3, 2022

Description: This work will consist of furnishing and installing a LED pendant luminaire with a teardrop refractor.

Material: Luminaires shall meet the requirements of Material Specification 1611. The luminaire must have the general appearance of Standard Drawing 931A. Pole wire shall meet the requirements of Material Specification 1351.

Installation: Installation must meet all applicable requirements of Sections 801 and 821.03 of the Standard Specifications. Luminaires must be securely attached to the end of a two-inch diameter pipe arm and leveled to provide proper illumination. The pole wire must be spliced to the field wire at the base of the pole using splicing methods approved by the Engineer.

Basis of Payment: This work will be paid for at the contract unit price per each for LUMINAIRE, LED, TEARDROP, CHICAGO 2000.

MATERIAL SPECIFICATION	DRAWINGS
1315	931A
1611	

ITEM 259 - ******** - CHICAGO 2000 14' PEDESTRIAN POLE

Description: This item will consist of furnishing and installing a historic pedestrian style fourteen foot light pole at the locations shown on the plans, or as directed by the Engineer.

Material: The pole must meet the requirements of Material Specification 1504. The pole must have the appearance as that shown on Standard Drawing 928.

Installation: Installation will be according to applicable requirements of Sections 801 and 830 of the Standard Specifications. The light pole must be set plumb on a concrete foundation using double nut construction. The nuts and washers should be part of the foundation item. The pole must be set with proper orientation of the handhole, as directed by the Engineer.

Any exposed portions of the anchor rods extending above the nuts which may interfere with setting the ornamental base must be cut off to provide the necessary clearance. The excess must not be burned off.

The contractor must utilize non-abrasive slinging materials and will otherwise exercise due care in erecting the pole to minimize any possible damage to the finish. When necessary, and approved by the Engineer, 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.

Method of Measurement: This work will be measured per each unit installed and will include all labor and material necessary to install the pole on the foundation, and must include the handhole door. This item will not include the ornamental base or the luminaire.

Basis of Payment: This item will be paid for at the contract unit price each for CHICAGO 2000 14' PEDESTRIAN POLE, which payment will be in full for furnishing and installing the pole in place.

MATERIAL SPECIFICATION	DRAWINGS
1504	928

ITEM 260 - ******** - CHICAGO 2000 14' PEDESTRIAN POLE BASE

Description: This item will consist of furnishing and installing an ornamental pole base for the fourteen foot pedestrian pole, as directed by the Engineer or as shown on the plans.

Material: The material must be fiberglass meeting the applicable requirements of Material Specification 1512 and Standard Drawing 928.

Installation: The base must be installed after the pole is erected. The base halves must be set around the pole shaft and secured to each other. The base must be set so that it sits evenly around the pole shaft. The base must be level and plumb so that it appears to be integral with the pole shaft. The base should sit level on the concrete foundation. Set screws must be used to keep the base from shifting about the shaft, and to attach the base to the pole as shown on Standard Drawing 928.

The contractor must exercise due caution in installing the base to minimize any possible damage to the finish. When necessary, and when approved by the Engineer, the contractor will utilize, at his own expense, factory approved touchup materials and methods to restore the finish to like new appearance and durability.

Method of Measurement: This item will be measured per each unit installed and must include the ornamental base and all necessary hardware to securely install the base on the foundation and around the pole shaft.

Basis of Payment: This work will be paid for at the contract unit price per each for CHICAGO 2000 14' PEDESTRIAN POLE BASE, which payment will be in full for furnishing and securely installing the ornamental base.

MATERIAL SPECIFICATION	DRAWINGS
1512	928

ITEM 261 - ****** - LUMINAIRE, LED, ACORN, CHICAGO 2000**

Revised: March 21, 2022

Description: This work will consist of furnishing and installing a LED ornamental acorn luminaire.

Material: Luminaires shall meet the requirements of Material Specification 1612. The luminaire must have the general appearance of Standard Drawing 932. Pole wire shall meet the requirements of Material Specification 1351.

Installation: Installation must meet all applicable requirements of Sections 801 and 821.03 of the Standard Specifications. The pole wire must be spliced to the field wire at the base of the pole using splicing methods approved by the Engineer. The luminaire must be properly mounted to a 3-inch high by 3-inch diameter tenon with set screws. The contractor must level and adjust the luminaire for proper illumination.

Basis of Payment: This work will be paid for at the contract unit price per each for LUMINAIRE, LED, ACORN, CHICAGO 2000.

MATERIAL SPECIFICATION	DRAWINGS
1315	932
1612	

ITEM 262 - ******** - MAINTENANCE OF STREET LIGHTING SYSTEM

Revised: October 31, 2021

Description: This work consists of furnishing all labor, equipment, and incidental materials for maintaining existing street lighting systems owned by the Chicago Department of Transportation (CDOT) until the proposed new equipment is installed, energized, tested, and accepted for operation by CDOT.

The work shall include any necessary temporary devices to maintain existing illumination. The location and protection of devices necessary to comply with these requirements shall be subject to the approval of the Engineer. The Engineer will be the sole judge of satisfying existing illumination levels.

Any temporary wire or cable which may be required to be installed overhead between existing poles or temporary devices shall be furnished, installed, terminated, and maintained in service until the proposed lighting equipment is installed, tested and accepted for operation by the Engineer.

Existing Lighting Systems to be Maintained:
CDOT Edison Atlas R-48 Group 7, R-49 Group 11 and S-49 Group 1

Material: Materials shall be according to the following CDOT Division of Electrical Operations (DEO) Specifications and Articles of Standard Specifications Section 1000 – Materials:

	Item	Requirement
(a)	Cable Splicing and Termination	Standard Specifications Article 1066.06
(b)	Fuse holders and Fuses	Standard Specifications Article 1065.01
(c)	Pole Wire	Material Specification 1351
(d)	Aerial Cable Assembly	Material Specification 1601
(e)	Thermal Magnetic Circuit Breaker	Material Specification 1428
(f)	Metal Light Poles	Material Specification 1447
(g)	Luminaires	Standard Specifications Article 1067

Material Acceptance: The Contractor shall provide a Manufacturer's written certification that the materials comply with these specifications.

General Requirements: General requirements shall be in accordance with Section 801 of the Standard Specifications, and in accordance with Division of Electrical Operations Standards and the City of Chicago Electrical Code, except as herein modified.

The Contractor shall maintain existing lighting systems (temporary and permanent) and proposed lighting systems, as well as receptacles and other ancillary devices connected to the applicable street lighting controllers. Effective the day the Contractor starts work (including non-electrical work), the Contractor shall maintain the existing lighting equipment located within the project limits as it then exists. The Contractor shall also maintain any street lighting equipment outside of the project limits but connected to a controller situated within the project limits. The Contractor shall also maintain any street lighting equipment inside of the project limits but connected to a controller situated outside the project limits.

The Scope of Work shall include the assumption of responsibility for the continuing operation of existing, temporary, or other lighting-systems affected by the work as may be specified elsewhere herein. Existing lighting systems, when depicted on the Plans, are intended only to indicate the general nature of the systems involved and shall not be construed as an exact representation of the field conditions. It remains the Contractor's responsibility to visit the site to confirm and ascertain the exact nature of systems to be maintained.

Preconstruction Inspection: Before performing any excavation, removal, or installation work (electrical or otherwise) at the site, the Contractor shall initiate a request for preconstruction inspection, to be held in the presence of the Engineer and a representative of the Chicago Department of Transportation Division of Electrical Operations. The request for the maintenance preconstruction shall be made no less than seven (7) calendar days prior to the desired inspection date. The maintenance preconstruction inspection shall:

- Establish details of any formal transfers of maintenance responsibility required for the construction period.

- Establish approximate locations of known lighting and/or traffic control systems, which may be affected by the work.

- Establish the condition of lighting and/or traffic control systems which may be affected by the Work.

Lighting System Maintenance Operations: To ensure a prompt response to incidents involving the integrity of the work zone street lighting devices, the Contractor shall provide a telephone number where a responsible individual can be contacted on a 24-hour-a-day basis. When the Commissioner is notified or determines a deficiency exists, (s)he will be the sole judge as to whether the deficiency is an immediate safety hazard. The Contractor shall dispatch sufficient resources within 12 hours of notification to make needed corrections of deficiencies that constitute an immediate safety hazard. Other deficiencies shall be corrected within 24 hours. If the Contractor fails to restore the required street light within the time limits specified above, the Commissioner will impose a daily monetary deduction for each 24-hour period (or portion thereof) the deficiency exists. This time period will begin with the time of notification to the Contractor and end with the Commissioner's acceptance of the below. In addition, if the Contractor fails to respond the Commissioner may correct the deficiencies and the cost thereof will be deducted from monies due or which may become due the Contractor. This corrective action will in no way relieve the Contractor of his/her contractual requirements or responsibilities.

Installation Requirements for Temporary Lighting Units: The Contractor shall furnish and install a temporary lighting unit to replace any existing lighting unit that is removed prior to the new lighting system being operational.

Temporary lighting unit shall include pole, mast arm, luminaire, and temporary wiring connections. The Contractor shall furnish and install temporary lighting units and all associated electrical equipment to ensure compliance with the applicable codes, standards, and Specifications.

The Contractor shall coordinate temporary lighting with the sequence of construction and maintenance of traffic for this Project.

The wiring on the pole shall consist of aerial electric cables and waterproof splices at each light pole.

All equipment furnished shall be functional and new in appearance and shall be maintained. The Contractor shall own all the temporary lighting equipment furnished and installed.

The Contractor shall disconnect and remove temporary lighting and all associated electrical equipment upon energizing and acceptance of the permanent lighting system.

Temporary Wiring: The Contractor shall furnish and install aerial electric cable, including messenger wire, in accordance with Section 818 of the Standard Specifications. The conductor size shall be Number 6 AWG minimum. The messenger wire shall be steel and of adequate size to support the cables from structure to structure under normal and adverse weather conditions.

The electric cables shall be secured to the steel messenger wire with binding strips continuous throughout each span of cable and shall be of adequate strength to support the size of electric cables required for this Project.

Temporary Poles: Temporary lighting poles may be used metal poles in accordance with Article 1069.01 of the Standard Specifications. Metal poles shall be similar in type, size and finish.

Temporary lighting poles may be used steel poles that comply with Division of Electrical Operations Specification Number 1447 if already owned by the Contractor and in stock.

The Contractor shall provide and remove temporary foundations for the metal poles that will be adequate to support the poles during normal and adverse weather conditions and as directed by the Engineer.

Temporary Luminaires: Each luminaire shall be a LED unit that meets the requirements of Material Specification 1613. Each luminaire shall be mast arm or bracket arm mounted on the top of the pole. Each luminaire shall be provided with a leveling surface and a leveling device and shall be capable of being tilted by plus or minus 30 degrees and rotated to any degree with respect to the supporting bracket. Each luminaire shall have a pipe arm barrier to limit the amount of inflection.

Installation: Location of cables and fixtures for temporary lighting shall be adjusted and supported to accommodate field conditions encountered, including any potential interferences with other construction or equipment to be installed.

The Contractor shall determine the exact route and location of each temporary lighting fixture and associated wiring, prior to installation.

Temporary lighting shall be installed to permit removal (without damage to other parts) of parts requiring periodic replacement or maintenance.

Temporary wiring/lighting shall be removed immediately upon acceptance of permanent lighting.

Method of Measurement: MAINTENANCE OF STREET LIGHTING SYSTEM will not be measured for payment but will be paid on a lump sum basis.

Basis of Payment: This work will be paid for the contract lump sum price for MAINTENANCE OF STREET LIGHTING SYSTEM which will be payment in full for maintaining the existing street lighting system until the proposed new equipment is installed, energized, tested, and accepted for operation by CDOT, furnishing, installing, and removing all temporary lighting units, aerial cable and ancillary equipment required to maintain the existing lighting system as described herein.

MATERIAL SPECIFICATION
1447
1613

ITEM 263 - ****** - REINSTALL BASE MOUNTED TRAFFIC SIGNAL CONTROLLER**

Description: This work will consist of reinstalling a traffic signal or street light controller onto a foundation.

Installation: The controller and cabinet will have been previously removed and stored or installed near the original installation on a temporary basis. This work will include re-installing the controller and cabinet and making all necessary connections. Removal from a temporary installation will be covered under a separate item. Any lengths of new cable required will be covered under other pay items.

Method of Measurement: This work will be measured per each controller reinstalled, and will include the cabinet and any wire connections necessary to make the controller fully functional.

Basis of Payment: This work will be paid for at the contract unit price each for REINSTALL BASE MOUNTED CONTROLLER, of the type specified, which payment will include all necessary labor to reinstall the controller. This will include all cable terminations necessary.

ITEM 264 - ****** - TREE, CATALPA SPECIOSA, 3" CAL, BALLED AND BURLAPPED**
ITEM 265 - ****** - TREE, CELTIS OCCIDENTALIS 'CHICAGOLAND', 3", BALLED AND BURLAPPED**
ITEM 266 - ****** - TREE, GINKGO BILOBA, 3", BALLED AND BURLAPPED**
ITEM 267 - ****** - TREE, GYMNOCLADUS DIOICUS, 3", BALLED AND BURLAPPED**
ITEM 268 - ****** - TREE, QUERCUS BICOLOR, 3" CAL, BALLED AND BURLAPPED**
ITEM 269 - ****** - TREE, QUERCUS X MACDANIELII 'CLEMONS', 3", BALLED AND BURLAPPED**
ITEM 270 - ****** - TREE, QUERCUS IMBRICATA, 3", BALLED AND BURLAPPED**
ITEM 271 - ****** - TREE, TAXODIUM DISTICHUM, 3", BALLED AND BURLAPPED**
ITEM 272 - ****** - TREE, TILIA AMERICANA, 3" CAL, BALLED AND BURLAPPED**
ITEM 273 - ****** - TREE, TILIA TOMENTOSA 'GREEN MOUNTAIN', 3", BALLED AND BURLAPPED**
ITEM 274 - ****** - TREE, ULMUS X 'NEW HORIZON', 3" CAL, BALLED AND BURLAPPED**
ITEM 275 - ****** - TREE, ULMUS X 'PATRIOT', 3", BALLED AND BURLAPPED**
ITEM 276 - ****** - TREE, AESCULUS FLAVA, 3", BALLED AND BURLAPPED**
ITEM 277 - ****** - TREE, SYRINGA RETICULATA 'IVORY SILK', 3", BALLED AND BURLAPPED**

Effective: February 1, 2010
Revised: March 20, 2019

Description: Work under this item shall be performed according to Section 253 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified. This work shall consist of excavation of the planting sites, removal and disposal of roots and spoil, and the purchase, transportation, storage, preparation and all materials required to plant balled and burlapped (B & B) trees.

Material: Materials shall be according to the following Section 1081 of the IDOT SSRBC except as herein modified:

	Section
Materials for Planting	1081.01
Shredded Hardwood Mulch	1081.06(b)

Trees
Nursery stock shall comply with American Standard for Nursery Stock ANSI Z60.1- 2014 (or latest edition). All trees shall be selected and tagged with a seal by Streets and Sanitation Bureau of Forestry ("BOF") or CDOT Foresters.

Backfill
Backfill for new construction sites shall consist of Pulverized Topsoil.
Backfill for existing sites shall be a variable mixture as determined by the Commissioner. To avoid interfaces created by dissimilar soils, utilize soil from the existing site as backfill. Or, if existing soil is of poor quality, backfill shall be a mixture of ½ excavated soil, and ½ pulverized top soil, as specified. The two soils shall be adequately mixed. Subsoils will not be allowed as backfill.
Pulverized Topsoil shall be paid separately.

Shredded Hardwood Bark Mulch

Hardwood bark mulch shall be clean, finely shredded mixed hardwood bark, not to exceed two (2) inches in its largest dimension, free of foreign matter, sticks, stones, and clods. All hardwood bark mulch shall be run through a hammer mill.

Staking and guying materials: (as directed by Commissioner)
Stakes: 6' fence T-Post.
Guy Wire: Galvanized mild steel wire, minimum 12 gauge; provide double strands.
Hose: Rubber or plastic garden hose.
Turnbuckles: Aluminum or galvanized steel.
Warning flaps: Fluorescent orange plastic surveyor's tape.

Tree wrap tape
Nurseryman's standard protective tape.

General Requirements:
Trees to be planted outside the Central Business District shall be installed in 5 x 10 sidewalk openings with volcanic rock unless otherwise noted in the plans or directed by the Commissioner.

Plant Delivery, Storage and Handling:
Schedule delivery to avoid storage on site. All plant roots and earth balls shall be kept damp and thoroughly protected from sun and drying winds at all times during transportation and on the ground until the final operation of planting is completed. If planting does not occur immediately, store plants in a location protected from sun, weather and theft.
Deliver freshly dug balled and burlapped stock unless otherwise approved.
Cover to protect stock during transport. Plant material transported without cover shall be automatically rejected.
Bind stock to protect branches, bark, and overall shape during transport. Protect tree trunks prior to loading and unloading.
Load and unload trees with care. Do not lift trees by wire basket or trunk. Dropped trees will not be accepted.
Do not prune trees unless directed by the Commissioner.

Pulverized Topsoil Handling
Pulverized topsoil shall be stored in stockpiles at the producer's or supplier's facility and shall be protected from erosion, absorption of excess water, and contamination at all times. Delivery to the job site shall only occur after the Commissioner has reviewed and approved the testing results.

Preparation and Execution
Installation cannot begin until the final grade has been achieved and soil has settled per plans. Trees planted in the parkway shall be planted in the center of the parkway, and/or in line with existing trees in the parkway. Trees planted in tree pits or sidewalk openings shall be centered. The Commissioner will approve the layout prior to installation.

Planting Trees
Tree planting method shall be demonstrated by the Contractor and approved by Commissioner prior to full scale installation.
All trees shall be planted completely, before leaving the planting location. Trees shall not be allowed to remain above ground at the planting site. Planting holes shall not be left excavated and open beyond the accepted hours of operation, i.e. 7:00 a.m - 3:00 p.m., Monday thru Friday,

unless directed by the Commissioner.

Submittals:
Shredded hardwood bark mulch sample in 1 quart sealed plastic container.
Volcanic rock sample in 1 quart sealed plastic container.
Request for Material Inspection Nursery Tree.
Tree wrap – sample
Pre-emergent herbicide-Material Safety Data Sheet
Permits- CDOT Right of Way permit and BOF permit

Construction Requirements:

Parkway Trees
Excavation
Soil shall be at finished grade and shall be settled per plans. Excavation shall not occur until the tree is on site and ready to be planted. The excavation shall be of sufficient depth to accommodate the tree root ball and shall be a minimum of twice (two times) the diameter of the root ball. New parkways shall be slightly depressed per plans. Excavation depth shall accommodate such depression.
The depth of the hole shall be such that the top of the root flare must be exposed and visible above grade. The sides shall slope gradually making the hole saucer shaped.
All soil shall be stockpiled for reuse or as otherwise directed (see Backfill).
Remove all excavated subsoil from the site and dispose of legally. Do not backfill excavation with subsoil.

Planting
Rootball flare shall be exposed per plans.
Untie all cords and remove all burlap and wire baskets from top 1/3 of the root ball.
Place backfill in 6" inch-thick layers. Work each layer by hand to compact backfill and eliminate voids. Maintain plumb during backfilling.
When backfilling is approximately 2/3 complete, saturate backfill with water and repeat until no more can be absorbed.
Place and compact remainder of backfill and water again.
Form watering basin around trunk with backfill holding at least 10 gallons.
Once soil has settled, add 3 inches of mulch in a 6' diameter saucer. Mulch shall not be piled against the tree trunk and shall not rise above sidewalk on newly constructed parkways.

Trees in grated pits and sidewalk openings
Excavation
Where tree grates are present, Contractor shall remove tree grate using due and reasonable care not to damage tree grate. Tree grates shall be replaced upon completion of planting operation. Contractor shall be held responsible for any damage to tree grates and shall replace tree grates, when damaged, at no cost to the City.
Soil shall be at finished grade and shall be settled per plans. Excavation of tree pits and sidewalk openings shall occur at the time of tree planting. Excavated areas shall not be left open.
Excavation shall include the removal of soil from the pits to a depth of at least three (3) feet and no more than three and one half (3-1/2) feet with vertical sides at the edge of the pit. Excavate with sides vertical, bottom flat except for a high center for drainage. Deglaze sides and loosen bottom.
The diameter of the planting hole shall be 2.5 times wider than the root ball or to the fullest

dimension of 5' x 5'or 4' x 6' tree pit. The depth of the hole shall be such that the top of the root ball is slightly higher than soil level per plans. New sidewalk openings shall be slightly depressed per plans. Excavation depth shall accommodate such depression.
Add pre-emergent herbicide per manufacturer's instructions as directed by Commissioner.
Remove all excavated subsoil from the site and dispose of legally. Do not backfill excavation with subsoil.
All soil shall be stockpiled for reuse or as otherwise directed (see Backfill).

Planting
Set plants on sub grade in excavated area. Graft and root ball flare shall be slightly higher than soil level allowing space for tree grate and/or volcanic rock. Ensure trees in new sidewalk openings are set to accommodate the slight depression per plans.
Untie all cords and remove all burlap and wire baskets from top 1/3 of the root ball.
Place backfill in 6" inch-thick layers. Work each layer by hand to compact backfill and eliminate voids. Maintain plumb during backfilling.
When backfilling is approximately 2/3 complete, saturate backfill with water and repeat until no more can be absorbed.
Place and compact remainder of backfill and water again with a minimum of 10 gallons of water.
Set or replace grate per plans. Place three to four inch (3-4") layer of one inch (1") black volcanic rock around trees in sidewalk openings.

Staking and Guying (as directed by Commissioner):
Guy and stake trees the same day as planting. Embed stakes 2 feet into grade. Tie with length of rubber of plastic hose to prevent wire loop from contracting tree trunk. Adjust to provide firm but not rigid support. Place guy wire equally spaced around trunk, with top of guy wire 6 to 7 feet above grade, and at 45-degree angle to vertical. Provide one turnbuckle per guy. Securely tie caution tape at the 1/3 and 2/3 points of each guy wire.

Pruning (as directed by Commissioner)
Remove dead or broken branches. Make cuts with sharp instruments outside the branch collar. Equipment shall be sterilized between cuts. Do not remove leaders from trees. All pruning must be performed under the direct supervision of a certified arborist.

Protection of tree trunks (as directed by Commissioner)
Inspect and, if necessary, treat trunks for physical damage or insect infestation.
Apply tree wrap to smooth barked trees in November and remove in April.
Natural areas and river embankment sites with herbivorous animal habitat shall include trunk protection in the form of a 6" diameter corrugated black plastic pipe at 36" in length.

QC/QA Requirements.
All plants shall be obtained from Illinois Nurserymen's Association or appropriate state chapter nurseries, in hardiness zones of comparable local climatic range to the City of Chicago and approved by the Commissioner. All trees shall be dug prior to leafing out (bud break) in the spring or when plants have gone dormant in the fall, except for the following species which are only to be dug prior to leafing out in the spring: (The Commissioner reserves the right to expand this list upon submittal of the Planting Schedule.)

Quercus (Oaks)
Robinia 'Chicago Blues' ('Chicago Blues' Black Locust)

Syringa reticulate (Japanese Tree Lilac)

Inspections
Trees will be inspected by CDOT at the nurseries prior to being delivered on site. This will be done via the Request for Material Inspection Nursery Tree ("RFINT") sheets. These sheets must be turned in to the CDOT Division of Engineering at least **6 weeks** prior to the expected date of installation. No trees shall be delivered without CDOT Seal. Plant material not installed within 60 days of initial inspection will be required to be re-inspected.
An on-site inspection shall be scheduled prior to the installation of trees. Any trees determined to not be in good health shall be removed from the site.

Watering
Watering bags shall not be used.
Tree watering shall be conducted once every 10-14 days or as determined by the Commissioner. The watering rate shall be 10 gallons per caliper inch of parkway tree and shall be conducted with a metal root watering probe with hose and brass splitters attached.
The probe should be inserted into the soil at varying depths and locations around and away from the root ball only. Under no circumstances should the probe be inserted into the root ball. More than one root probe may be used.
Water shall be showered from above directly upon the root ball and surrounding soil upon insertion of the probe.
Watering method and frequency shall be approved by the Commissioner prior to tree installation.

Period of Establishment
Prior to being accepted, the plants shall endure a period of establishment in accordance with section 253.14 of the Standard Specifications except that the period of establishment will be two (2) years pursuant to the Code of Federal Regulations: 23 C.F.R. § 752.4 Landscape Development.

Volcanic Rock
During the period of establishment, Contractor shall make inspections of Volcanic Rock periodically to ensure that level of volcanic rock in both tree pits and sidewalk openings has been maintained. Volcanic rock shall be replenished under grates to remove all voids due to settling.

Method of Measurement:
TREE, CATALPA SPECIOSA, 3", BALLED AND BURLAPPED
TREE, CELTIS OCCIDENTALIS 'CHICAGOLAND', 3", BALLED AND BURLAPPED
TREE, GINKGO BILOBA, 3", BALLED AND BURLAPPED
TREE, GYMNOCLADUS DIOICUS, 3", BALLED AND BURLAPPED
TREE, QUERCUS BICOLOR, 3", BALLED AND BURLAPPED
TREE, QUERCUS X MACDANIELII 'CLEMONS', 3", BALLED AND BURLAPPED
TREE, QUERCUS IMBRICATA, 3", BALLED AND BURLAPPED
TREE, TAXODIUM DISTICHUM, 3", BALLED AND BURLAPPED
TREE, TILIA AMERICANA, 3", BALLED AND BURLAPPED
TREE, TILIA TOMENTOSA 'GREEN MOUNTAIN', 3", BALLED AND BURLAPPED
TREE, ULMUS X 'NEW HORIZON', 3", BALLED AND BURLAPPED
TREE, ULMUS X 'PATRIOT', 3", BALLED AND BURLAPPED
TREE, AESCULUS FLAVA, 3", BALLED AND BURLAPPED

TREE, SYRINGA RETICULATA 'IVORY SILK', 3", BALLED AND BURLAPPED
will be measured per each. Only acceptable trees will be measured for payment. All materials required to provide and establish healthy, thriving tree material shall be considered incidental to this item.

Basis of Payment:
TREE, CATALPA SPECIOSA, 3", BALLED AND BURLAPPED
TREE, CELTIS OCCIDENTALIS 'CHICAGOLAND', 3", BALLED AND BURLAPPED
TREE, GINKGO BILOBA, 3", BALLED AND BURLAPPED
TREE, GYMNOCLADUS DIOICUS, 3", BALLED AND BURLAPPED
TREE, QUERCUS BICOLOR, 3", BALLED AND BURLAPPED
TREE, QUERCUS X MACDANIELII 'CLEMONS', 3", BALLED AND BURLAPPED
TREE, QUERCUS IMBRICATA, 3", BALLED AND BURLAPPED
TREE, TAXODIUM DISTICHUM, 3", BALLED AND BURLAPPED
TREE, TILIA AMERICANA, 3", BALLED AND BURLAPPED
TREE, TILIA TOMENTOSA 'GREEN MOUNTAIN', 3", BALLED AND BURLAPPED
TREE, ULMUS X 'NEW HORIZON', 3", BALLED AND BURLAPPED
TREE, ULMUS X 'PATRIOT', 3", BALLED AND BURLAPPED
TREE, AESCULUS FLAVA, 3", BALLED AND BURLAPPED
TREE, SYRINGA RETICULATA 'IVORY SILK', 3", BALLED AND BURLAPPED
will be paid for at the contract price per each, which price shall include furnishing and installing the plant material of the type and size specified, and all materials, equipment and labor necessary to complete the work. Also included with these items is all initial maintenance and establishment as described.

ITEM 278 - ******** - ARBORIST INSPECTION

Description: This section specifies Arborist Inspection for protection and maintenance of existing trees that are to remain on or near the construction site.

Arborist Qualifications: Arborist must submit a resume with the following qualifications:

1. Arborist International Society of Arboriculture (I.S.A.), Certified with 10 years of experience.
2. Horticulturist with A.S. Horticulture degree, Illinois Pesticide Applicators License and substantial years experience in installation and maintenance of comparable landscapes in size and value.
3. Foreman with A.S. Horticulture degree or comparable training, Illinois Pesticide Operators License and substantial years supervisory landscape maintenance and installation experience.

General Requirements:

Submit written certification by qualified Arborist that trees indicated to remain have been protected during the course of construction in accordance with TREE PROTECTION specifications and that if damage did occur, trees were promptly and properly treated. Indicate which damaged trees (if any) are incapable of retaining full growth potential and are recommended to be replaced.

Documentation of damage to new and existing trees within the project limits.

Submit and Arborist report including the following:
1. Inspect new and existing trees and TREE PROTECTION and inventory status of trees prior to construction.
2. Inspect new and existing trees and TREE PROTECTION during construction. Report problems or damage. A minimum of two visits is required during construction to insure the protection of trees.
3. Inspect trees after construction and inventory status of trees.
4. Recommend procedure to compensate for minimal loss of roots where construction is to occur within the root zone of existing plant material and supervise tree root pruning.
5. Oversee removal of branches from trees that are to remain, if required. Arborist must submit a pruning inventory report prior to the star of pruning works.
6. Oversee inspection and removal of Fraxinus (ash) trees, including grinding/chipping in TREE REMOVAL.
7. Recommend procedures for excavation and grading work near existing trees.
8. Recommend and supervise tree mitigation work as defined in TREE PROTECTION for damage incurred by new construction.

Method of Measurement: ARBORIST INSPECTION will be paid per lump sum.

Basis of Payment: ARBORIST INSPECTION will be paid for on a lump sum unit price. All arborist reports are incidental to this item.

ITEM 279 - ****** - LAVA ROCK MULCH**

Description: The work under this item shall consist of furnishing, transporting, and placing black lava rock mulch into planting beds around existing trees or along new decorative fencing as shown in the plans or as directed by the Engineer. Placement of lava rock mulch around new trees will be addressed under the item SHADE TREE, 3" CAL, BALLED AND BURLAPPED.

Material: Mulch shall be Volcanic Rock, Large Rock, Black, 1" in size, free of foreign materials. A 1 qt. sample shall be provided for approval prior to installation.

The Contractor shall remove all litter and plant debris before mulching. The Contractor shall repair grade by raking and adding Structural Soil as needed, before mulching. Care shall be taken not to bury leaves, stems, or vines under mulch material.

The Contractor shall supply and install lava rock mulch to mulch around trees, shrubs and herbaceous plants in landscaped planting beds. Existing trees require a four (4) foot minimum diameter ring around the base of the tree.

All finished mulch areas shall be left smooth and level to maintain a uniform surface and appearance. All tree grate areas or work areas shall be clean of debris and mulch, prior to leaving the site.

General Requirements: All finished mulch areas shall be left smooth and level to maintain a uniform surface and appearance. All work areas shall be clean of debris and mulch prior to leaving the site.

Construction Requirements: Place mulch manually around plants as follows:

> Annuals: Spread one (1) inch of mulch lightly through annual plantings.
> Perennials, bulbs, groundcovers, vines, grasses: Spread two (2) inches of mulch around plants. Ensure mulch is away from crowns of plants.
> Shrubs, including roses: Spread three (3) inches of mulch around shrub. Ensure mulch is away from stems and crown of shrub.
> Trees, shade and ornamental: Spread three (3) inches of mulch around trees. Do not pile mulch around trunk; ensure root flare is visible.

Method of Measurement: LAVA ROCK MULCH will be measured for payment in place per cubic yard.

Basis of Payment: This work shall be paid for at the contract unit price per cubic yard for LAVA ROCK MULCH.

ITEM 280 - ****** - SHREDDED HARDWOOD BARK MULCH**

Effective: June 1, 2012
Revised: March 21, 2022

Description: The work under this item shall consist of furnishing, transporting, and placing shredded hardwood mulch into planting beds or around trees as described herein.

Material: Hardwood bark mulch shall be clean, finely shredded mixed hardwood bark, not to exceed two (2) inches in its largest dimension, free of foreign matter, sticks, stones, and clods. All hardwood bark mulch shall be processed through a hammermill.

General Requirements: The Contractor shall supply and install shredded hardwood bark mulch to mulch around trees, shrubs and herbaceous plants in landscaped planting beds. Existing trees require a four (4) foot minimum diameter ring around the base of the tree. Annual areas shall be mulched with pine bark fines.

The Contractor shall remove all litter and plant debris, repair grade by raking and adding planter soil mix as needed prior to mulching. Care shall be taken not to bury leaves, stems, or vines under mulch material.

All finished mulch areas shall be left smooth and level to maintain a uniform surface and appearance. All work areas shall be clean of debris and mulch prior to leaving the site.

Submittals: A sample shall be provided prior to performing the work.

Construction Requirements: Place mulch manually around plants as follows:

> Trees, shade and ornamental: Spread three (3) inches of mulch around trees. Do not pile mulch around trunk; ensure root flare is visible.

Mechanical or power mulch systems are not acceptable methods of placing shredded hardwood mulch.

Method of Measurement: SHREDDED HARDWOOD BARK MULCH will be measured in place and the area computed in square yards.

Basis of Payment: This work will be paid at the contract unit price per square yard for SHREDDED HARDWOOD BARK MULCH which price shall be payment for completing the work as specified.

ITEM 281 - ****** - PERENNIAL, DIERVILLA LONICERA, 5 GA, CG**
ITEM 282 - ****** - PERENNIAL, HEMEROCALLIS 'ROSY RETURNS', 5GA, CG**

Effective: June 1, 2010
Revised: February 17, 2016

Description: This work shall consist of the purchase, transportation, storage, preparation and all tools required to plant balled and burlapped (B&B)shrubs, container shrubs, perennials, grasses, ground covers and bulbs. A (1) year period of establishment on all plant material is included under these pay items.

Material: Materials shall be according to the following Articles of Division 1000 - Materials of the Standard Specifications except as herein modified:

	Article/Section
Materials for Planting	1081.01

A. Shrubs-Nursery stock shall comply with American Standard for Nursery Stock ANSI Z60.1- 2014 (or latest edition).

1. Provide nursery grown stock unless specifically indicated otherwise.
    a. General: Well-branched and well-formed, sound, fibrous, healthy and free from disease, sun-scald, wind burn, abrasion and harmful insects or insect eggs with healthy, normal and unbroken root systems.
    b. Deciduous shrubs: Symmetrically developed of uniform habit of growth with straight trunks or stems and free from objectionable disfigurements.
    c. Coniferous evergreen shrubs: Well-developed symmetrical tops with typical spread of branches for each particular species or variety.
    d. Provide stock complying in all respects with ANSI Z60.1 and in sizes indicated, measured in accordance with ANSI Z60.1. Larger sizes with larger roots and root containment may be furnished if approved by the Commissioner.
        i. Do not spread or compress branches when measuring. Measure main body of branches; do not measure extreme tips of single branches.
        ii. Pruning to size is not acceptable.
        iii. Up to 4 inches caliper, measure caliper at 5 inches above ground.
    e. Tag each variety of shrub to indicate common and botanical name.

2. Deciduous shrubs

    Container grown only

3. Coniferous evergreens

    Container grown only

B. Ground Cover, Perennials and Ornamental Grasses

Provide field-grown or acclimatized container-grown plants from a commercial nursery, healthy, vigorous, of sizes indicated.

C. Bulbs, Corms and Tubers

Provide bulbs, corms, or tubers, free of rot or disease. Top sized bulbs shall be provided unless otherwise specified.

D. Miscellaneous Landscape Materials

1. Anti-desiccant: Film-forming emulsion, permeable to transpiration, while retarding excessive moisture loss.

2. Staking and guying materials: (per Commissioner request only)
    a. Stakes: 6' metal T posts.
    b. Wire: Galvanized mild steel wire, minimum 12 gauge; provide double strands.
    c. Hose: Rubber or plastic garden hose.
    d. Turnbuckles: Aluminum or galvanized steel.
    e. Warning flaps: Fluorescent orange plastic surveyor's tape.

General Requirements:

1. The Contractor shall begin locating all specified plant material immediately upon contract award or make arrangements for custom grown nursery stock as directed by the Commissioner. All specified plant material requiring substitution due to unavailability or inferior quality shall be selected and/or approved by CDOT Division of Engineering-Landscape Section. Proof that the plant material is secured must be on file with the Commissioner prior to the processing of any payment to the Contractor. However, if the Contractor proceeded to do everything required to secure the specified plants and for reasons beyond the Contractor's control plant substitutions are required, such substitution shall follow the process detailed below.

Substitutions:

The Contractor shall make every effort to maintain the design intent of all landscape plans. To this end, substitutions of plant material shall be kept to an absolute minimum and requests for substitutions shall adhere to the following requirements.

A. Requests for substitution of plant material shall be submitted for review **eight (8) weeks PRIOR** to scheduled plant installation or, for projects scheduled over a year in duration, as indicated by CDOT. All proposed substitutions are subject to approval by the Commissioner.

B. Requests for plant substitutions shall be submitted in writing and list contract item numbers, quantity, original plant name (botanical and common), original size, nurseries contacted (with phone numbers) for original material (10 minimum), name of substitution (botanical and common), and size. The Contractor shall contact a minimum of ten (10) nurseries in search of a plant before that plant can be eligible for substitution.

C. If substitutions are approved for smaller sized plant material, new line items will be added to the contract as a contract modification. The unit price will be adjusted to reflect the lower cost of smaller plant material. The units may be increased depending on the plant material in question and upon approval by the Commissioner.

Inspections:

A. Request for Inspection Plant Material ("RFIPM") and Request for Material Inspection Nursery Trees ("RFINT") must be turned in to the Division of Engineering at least **6 weeks prior** to the expected date of installation. Plant material not installed within 60 days of initial inspection will be required to be re-inspected. RFIPM's for fall planting will not be accepted after September 1 unless otherwise approved by CDOT Engineering Landscape Section.

B. Plant inspections for materials other than trees will occur through submission of three (3) digital photographs per species which includes but is not limited to the following:

1. Photo of a representative plant next to a ruler
2. Photo the root system of said plant
3. Group photo of entire crop

Photographed plant materials shall be inspected at the nursery as directed by the Commissioner.

C. An on-site inspection by CDOT will be made prior to the installation of plant material. Any plant material not meeting specification (that being of good health) must be moved off the site.

Plant Delivery, Storage and Handling:

A. Schedule delivery to avoid storage on site. If planting does not occur immediately, store plants in a location protected from sun, weather and theft.

B. Do not prune shrubs unless directed by the Commissioner.

C. Cover to protect stock during transport. Plant material transported without cover shall be automatically rejected.

D. Bind stock to protect branches, bark, and overall shape during transport.

E. Balled and burlapped stock: Provide freshly dug stock unless otherwise approved.

F. Do not drop stock. Load and unload with care.

G. Protect all plants prior to loading and unloading. Damaged plants will be rejected on site.

Guidelines:

A. Planting season: (As herein specified or as directed by the Commissioner)

Herbaceous Plants:	April 15 to October 15
Where Irrigated:	April 15 to June 15
Non-Irrigated:	September 15 to October 15
Woody Plants:	March 15 to November 30
Where Irrigated:	March 15 to June 30
Non-Irrigated:	October 1 to November 30

Bulbs: October 15 to November 30

B. Do not plant when soil is muddy or during frost.

C. Dates are dependent on species of plant material and weather. Planting might begin or end prior or after above dates as approved by Commissioner.

D. No plant material shall be installed prior to the final grade of the planting soil.

E. No plant material shall be installed before below-ground irrigation system components have been installed and operational.

F. Trees must be installed first to establish proper layout and to avoid damage to other plantings.

Preparation and Execution:

A. Installation cannot begin until the final grade has been achieved and soil has settled for a minimum of one week or as directed by the Commissioner.

B. The Contractor shall be responsible for all plant layout. The layout must be performed by qualified personnel. The planting locations must be laid out as shown in the landscape plan; use of an engineer's scale may be necessary to determine some dimensions. The tree locations must be marked by staking and bed limits must be painted. The Commissioner will approve the layout prior to installation.

C. After September 1 or in temperatures above 84 F, all plant material will be treated with anti-desiccant prior to installation or as directed by the Commissioner.

Initial Maintenance:

A. Initial Maintenance: The Contractor is responsible for maintenance of each area until it has been accepted by the Commissioner by issuance of Final Punch-List Completion letter, and the time of establishment has formally started.

B. Begin maintenance when the final grade has been achieved in any one location.

C. Initial Maintenance includes weeding and trash removal from the area to be landscaped. The contractor will provide Initial Maintenance a minimum of once per week, or as directed by the Commissioner.

D. Plants shall be watered immediately upon installation and on a regular basis thereafter. If the irrigation system is not able to provide enough water to establish the plants, the contractor will provide supplemental watering at no additional cost.

E. Initial Maintenance is intended to maintain all plants in a healthy and vigorous condition. This may require pruning, cultivating, replanting, tightening and repairing of supports, repair of wrapping, and furnishing and applying sprays as necessary to keep the plants free of insects and disease.

F. Initial Maintenance is incidental to these pay items.

Submittals:

A. Within 60 days of Contract Award, Contractor must submit proof that required plant material for Contract is secured. (For Substitutions see "Quality Assurance" & "Substitutions".)

B. Request for Materials Inspection Plant Material and Nursery Trees.

C. Digital photographs of plant material not inspected at the nursery

D. Anti-desiccant label and Material Safety Data Sheet

Construction Requirements:

A. Excavation for Shrubs

1. Pits, beds and trenches: Excavate with sides vertical, bottom flat but with high center for drainage. Deglaze sides and loosen bottom.

2. Minimum dimensions, individual pits (unless prevented by planter wall):
   a. The diameter of the hole shall be 1 foot wider than the root spread.
   b. The depth of the hole shall be such that the top of the root flare must be exposed and visible above grade.

3. Remove all excavated subsoil from the site and dispose of legally. Do not backfill excavation with subsoil.

B. Planting Shrubs

1. Setting layer: Place and compact a layer of planting soil, of thickness indicated, in bottom of excavation.

2. Balled and Burlapped Stock: Set in excavation with the root flare exposed and visible above finished grade. Add soil as required under ball to achieve plumb.
   a. Untie all cords binding burlap to trunk. Remove all burlap and wire baskets from top 1/3 of the root ball.
   b. Place backfill in 6" inch-thick layers. Work each layer by hand to compact backfill and eliminate voids. Maintain plumb during backfilling.
   c. When backfilling is approximately 2/3 complete, saturate backfill with water and repeat until no more can be absorbed.
   d. Place and compact remainder of backfill and water again.

3. Inspect and, if necessary, treat trunks for physical damage or insect infestation

C. Container-Grown Plants: Place and backfill as specified for balled and burlapped stock and as follows:

1. Immediately before placing, remove container and do not damage the root system.

2. Set and plumb plants even with grade. Place backfill to thoroughly cover all roots.

D. Form watering basin around trunk with backfill holding at least 5 gallons for shrubs. Apply moisture retaining mulch.

E. Pruning

1. Remove dead or broken branches.

2. Make cuts with sharp instruments within the branch collar. Do not remove leaders. All pruning must be performed under the direct supervision of a certified arborist.

F. Planting Ground Cover and Small Plants

1. Open holes sized to accommodate roots, place plants at proper elevation and backfill with planting soil, working carefully to avoid damage to roots and to leave no voids. Build up a small water basin of planting soil around each plant.

2. Immediately after planting water well. Do not wash soil onto crowns of plants.

G. Bulbs
Plant all bulbs as detailed and as shown on the landscape drawings.

QC/QA Requirements:

A. Plant Material
All plants shall be obtained from Illinois Nurserymen's Association or appropriate state chapter nurseries, in hardiness zones of comparable local climatic range to the City of Chicago and approved by the Commissioner. All shrubs shall be dug prior to leafing out (bud break) in the spring or when plants have gone dormant in the fall.

B. Labor
1. Qualifications
a. The landscape contractor shall provide proof that the firm has the experience, ability and equipment that the work requires.
b. The landscape contractor shall provide at least one supervisor who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials and design methods of the material being installed.
c. The designated supervisor shall be present at all pertinent construction meetings and shall be on-site throughout the duration of the landscape portion of the project. This designated supervisor is the main point of contact between all parties involved in the landscape installation and shall be responsible for all submittals, schedules and samples required pursuant to the Contract Documents.
d. The designated supervisor shall manage a minimum sized crew consisting of at least four (4) individuals. The crew shall not work on site without the designated supervisor present.

e. The designated supervisor shall be familiar with all pertinent Drawings and Specifications included in the Contract Documents and shall provide clear direction for all crew members involved.

2. Experience Requirement: The landscape contractor and the designated supervisor outlined above must meet the following requirements:
   a. Minimum of five (5) years of successful and continuous experience on projects of this type, size and scope.
   b. Proof of the above requirements including photographic evidence of projects at installation and at different stages of maturity.
   c. If applicable, demonstrate previous successful projects installed on behalf of CDOT.

Period of Establishment
Prior to being accepted, the plants shall endure a period of establishment in accordance with 23 C.F.R. § 752.4 Landscape development and Section 253.14 of the Standard Specifications except that the period of establishment will be (1) year for plant material.

Method of Measurement:
PERENNIAL, DIERVILLA LONICERA, 5 GA, CG
PERENNIAL, HEMEROCALLIS 'ROSY RETURNS', 5GA, CG
will be measured per each. Only acceptable plants will be measured for payment. All materials required to provide and establish healthy, thriving plant material shall be considered incidental to this item.

Basis of Payment:
PERENNIAL, DIERVILLA LONICERA, 5 GA, CG
PERENNIAL, HEMEROCALLIS 'ROSY RETURNS', 5GA, CG
will be paid for at the contract price per each, which price shall include furnishing and installing the plant material of the type and size specified, and all materials, equipment and labor necessary to complete the work. Also included with these items is all initial maintenance and establishment as described.

ITEM 283 - ****** - DECORATIVE STEEL BOLLARD**
ITEM 284 - ****** - DECORATIVE STEEL BOLLARD (REMOVABLE)**

Description: This work must consist of furnishing and installing steel bollards and concrete foundations at the locations specified in the Contract plans or as directed by the Commissioner.

General Requirements: Each bollard will be placed at the location indicated in the plans. The locations will be field marked and verified for approval by the Commissioner.

ASSEMBLY
Bollards shall be installed in concrete foundations as shown on plans.

MATERIALS
Bollards are to be 4" SCH 50 steel pipe (4.5" o.d.) with welded steel caps. Bollars are to be embedded in a concrete foundation, not surface mounted.

MANUFACTURER
DuMor, Inc.
PO Box 142 Mifflintown, PA 17059

Model:
DECORATIVE STEEL BOLLARD = Bollard 400 S-1 Embedded
DECORATIVE STEEL BOLLARD (COLLAPSABLE) = Bollard 400 S-1SL with sleeve and cap.

Or Approved Equal

FINISH- Powdercoat Black

SUBMITTALS
Submit manufacturer's technical data for each manufactured product, including certification that each product complies with the specified requirements. In accordance with the Standard Specifications, the Contractor must submit shop drawings for the Commissioner's approval showing the bollard completely assembled including shop drawings of its component parts.

Method of Measurement: DECORATIVE STEEL BOLLARD and DECORATIVE STEEL BOLLARD (REMOVABLE) will be measured in place per each unit installed.

Basis of Payment: The work under this item will be paid for at the contract unit price per each DECORATIVE STEEL BOLLARD and DECORATIVE STEEL BOLLARD (REMOVABLE), which price will include labor, concrete foundations, sleeves, caps, equipment, materials and incidental work necessary to complete the installation as specified.

ITEM 285 - ****** - FURNISH AND INSTALL RECTANGULAR RAPID FLASHING BEACON SINGLE SIDED- COMPLETE ASSEMBLY**
ITEM 286 - ****** - FURNISH AND INSTALL RECTANGULAR RAPID FLASHING BEACON DOUBLE SIDED- COMPLETE ASSEMBLY**

Description: This work shall consist of furnishing and installing a Rectangular Rapid Flashing Beacon (RRFB) System, Complete with light emitting diodes flashing beacons, solar system, batteries, push-button, wireless communication system, mounting post, and foundation.

General: The RRFB unit shall be MUTCD and ITE compliant. An RRFB shall only be used to supplement a W11-2 (Pedestrian) warning sign with a diagonal downward arrow (W16-7p) plaque, located at or immediately adjacent to a marked crosswalk.

The manufacturer of all equipment shall have a representative and shop located in the six (6) county Chicago areas. All equipment installed in the RECTANGULAR RAPID FLASHING BEACON SYSTEM, Complete shall be from a single supplier. The supplier shall be responsible for service and support for this equipment. Each RRFB shall include an amber LED verification indicator mounted 90 degree from the faces of the crossing warning signs. This amber LED shall be used to confirm actuation of the RRFB system from the opposite end of the crossing. RRFB system shall have two (2) verification indicators facing to opposite directions. All mounting hardware shall be stainless steel.

Material.LED Beacon:

1. Beacon Dimensions and Placement in Sign Assembly:
    a. Each RRFB shall consist of two rectangular-shaped yellow indications, each with an LED- array based light source. Each RRFB indication shall be a minimum of approximately 5 inches wide by approximately 2 inches high.
    b. The two RRFB indications shall be aligned horizontally, with the longer dimension horizontal and with a minimum space between the two indications of approximately seven inches (7 in), measured from inside edge of one indication to inside edge of the other indication.
    c. The outside edges of the RRFB indications, including any housings, shall not project beyond the outside edges of the W11-2 sign.
    d. The RRFB shall be located between the bottom of the crossing warning sign and the top of the supplemental downward diagonal arrow plaque rather than 12 inches above or below the sign assembly.
2. Beacon Flashing Requirements:
    a. When activated, the two yellow indications in each RRFB shall flash in a rapidly alternating "wigwag" flashing sequence (left light on, then right light on).
    b. Each of the two yellow indications of an RRFB shall have 70 to 80 periods of flashing per minute and shall have alternating but approximately equal periods of rapid pulsing light emissions and dark operation. During each of its 70 to 80 flashing periods per minute, one of the yellow indications shall emit two rapid pulses of light and the other yellow indication shall emit three rapid pulses of light.
    c. The Flasher unit shall be MUTCD and ITE compliant.
3. Beacon Operation:
    a. The RRFB shall be normally dark, shall initiate operation only upon pedestrian actuation, and shall cease operation at a predetermined time after the pedestrian actuation or, with passive detection, after the pedestrian clears the crosswalk.

b. All RRFBs associated with a given crosswalk shall, when activated, simultaneously commence operation of their alternating rapid flashing indications and shall cease operation simultaneously.
c. A pedestrian instruction sign with the legend PUSH BUTTON TO TURN ON WARNING LIGHTS should be mounted adjacent to or integral with each pedestrian pushbutton.
d. A small light directed at and visible to pedestrians in the crosswalk may be installed integral to the RRFB or push button to give confirmation that the RRFB is in operation.

Power source:

Solar system and batteries and AC power:

The beacon shall be able to operate both on 12 V DC with solar powered battery source or hardwire 120V AC power source. The batteries and solar panel shall be post top mounted. The unit will have a minimum array and load capacity of 6A at a nominal 12VDC. Batteries are UL certified AGM 12V, and are field-replaceable.

Push-Button:

The normal state of the latching LED shall be off. When the push button is pressure activated, the LED shall be lighted and remain on until end of a predesignated time. Stations shall be designed to be mounted directly to a post. The station shall be aluminum and shall accept a 3 inch (75mm) round push-button assembly and a regulatory pedestrian instruction sign.

Controller and Wireless Communication System:

The crosswalk flasher units will be linked to each other using a spread spectrum radio link (900-930Mhz operating frequency). The radio will be capable of passing data via RS232. The radio will operate from a nominal 12VDC source and include a status LED lamp to indicate power on. CONTRACT NO. 1628-15554 S-225 RRFB controller shall have the ability to modify operation cycles and be programmed via Windows vase software.

Warranty:

All RRFB components, systems, batteries and installation shall be warranted for a minimum of three (3) year after completed and accepted. Replacement of failed equipment and/or parts shall include labor to remove the failed parts, install new one and proper disposal of the failed parts.

Basis of Payment: This work will be paid for at the contract unit price EACH for FURNISH & INSTALL RECTANGULAR RAPID FLASHING BEACON SINGLE SIDED- COMPLETE ASSEMBLY or FURNISH & INSTALL RECTANGULAR RAPID FLASHING BEACON DOUBLE SIDED- COMPLETE ASSEMBLY, which price shall be payment in full for furnishing and installing Rectangular Rapid Flashing Beacon System, complete with necessary connections. Signs will be paid for separately.

ITEM 287 - ****** - RAILROAD PROTECTIVE LIABILITY INSURANCE**

Description: Railroad Protective Liability and Property Damage Liability Insurance shall be carried according to Article 107.11 of the Standard Specifications, except that the limits shall be a minimum of $5,000,000 combined single limit per occurrence for bodily injury liability and property damage liability with an aggregate limit of $10,000,000 over the life of the policy. A separate policy is required for each railroad and location unless otherwise noted.

Approximate Address of Crossing: 470 E 111th Street, Chicago, IL (overhead Metra/CN):

NAMED INSURED AND ADDRESS	NUMBER & SPEED OF PASSENGER TRAINS	NUMBER & SPEED OF FREIGHT TRAINS
METRA 547 W. Jackson Blvd. Chicago, IL 60661	Daily Passenger Trains (avg.): 6 Maximum Speed: 65mph	Daily Freight Trains (avg.): Day: 99 Night: 52 Maximum Speed: 65mph

DOT/AAR No.: 289594C RR Mile Post: 0014.00
RR Division: SOUTHERN RR Sub-Division: CHICAGO
For Freight/Passenger Information Contact: Marilyn Schilsmann
Phone: (312) 322-7029
For Insurance Information Contact: Marilyn Schilsmann
Phone: (312) 322-7029

Approximate Address of Crossing: 717 E. 111th Street, Chicago, IL (at Grade, NS):

NAMED INSURED AND ADDRESS	NUMBER & SPEED OF PASSENGER TRAINS	NUMBER & SPEED OF FREIGHT TRAINS
Norfolk Southern Railroad 361 W. 47th Street Chicago, IL 60609	DAILY PASSENGER TRAINS (AVG.): 0	DAILY FREIGHT TRAINS (AVG.): 1 SPEED RANGE: 5MPH-10MPH MAXIMUM SPEED: 10MPH

DOT/AAR No.: 608321R RR Mile Post: 0002.58
RR Division: GREAT LAKES RR Sub-Division: PULLMAN BRANCH
For Freight/Passenger Information Contact: Scott Overbay
Email: Scott.Overbay@nscorp.com
For Insurance Information Contact: Scott Overbay
Email: Scott.Overbay@nscorp.com

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

Chicago Department of Transportation
Division of Engineering
2 North LaSalle Street, Suite 800
Chicago, Illinois, 60602
Attn.: Deputy Commissioner
RE: ISW Pullman: 111th Street and Cottage Grove Avenue Improvements

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

Basis of Payment: Providing Railroad Protective Liability and Property Damage Liability Insurance will be paid at the contract unit price per Lump Sum for RAILROAD PROTECTIVE LIABILITY INSURANCE.

SECTION III

APPENDICES

APPENDIX A

ILLINOIS DEPARTMENT OF TRANSPORTATION SPECIFICATIONS

ILLINOIS DEPARTMENT OF TRANSPORTATION
(IDOT)
INDEX FOR SUPPLEMENTAL SPECIFICATIONS AND RECURRING SPECIAL PROVISIONS (JANUARY 1, 2024)

Illinois Department of Transportation

Check Sheet for Recurring Special Provisions

Local Public Agency	County	Section Number
Chicago Department of Transportation	Cook	

☐ **Check this box for lettings prior to 01/01/2024.**

The Following Recurring Special Provisions Indicated By An "X" Are Applicable To This Contract And Are Included By Reference:

Recurring Special Provisions

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Local Public Agency	County	Section Number
Chicago Department of Transportation	Cook	

The Following Local Roads And Streets Recurring Special Provisions Indicated By An "X" Are Applicable To This Contract And Are Included By Reference:

Local Roads And Streets Recurring Special Provisions

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ILLINOIS DEPARTMENT OF TRANSPORTATION
(IDOT)
BDE SPECIAL PROVISIONS
(FOR THE JANUARY 19, 2024 AND MARCH 8, 2024 LETTINGS)

BDE SPECIAL PROVISIONS
For the January 19 and March 8, 2024 Lettings

The following special provisions indicated by a "check mark" are applicable to this contract and will be included by the Project Coordination and Implementation Section of the Bureau of Design & Environment (BDE).

File Name	#		Special Provision Title	Effective	Revised
80099	1	☐	Accessible Pedestrian Signals (APS)	April 1, 2003	Jan. 1, 2022
80274	2	☒	Aggregate Subgrade Improvement	April 1, 2012	April 1, 2022
80192	3	☐	Automated Flagger Assistance Devices	Jan. 1, 2008	April 1, 2023
80173	4	☒	Bituminous Materials Cost Adjustments	Nov. 2, 2006	Aug. 1, 2017
80426	5	☐	Bituminous Surface Treatment with Fog Seal	Jan. 1, 2020	Jan. 1, 2022
* 80241	6	☐	Bridge Demolition Debris	July 1, 2009	
* 5053I	7	☐	Building Removal	Sept. 1, 1990	Aug. 1, 2022
* 5026I	8	☐	Building Removal with Asbestos Abatement	Sept. 1, 1990	Aug. 1, 2022
80449	9	☐	Cement, Type IL	Aug. 1, 2023	
80384	10	☒	Compensable Delay Costs	June 2, 2017	April 1, 2019
* 80198	11	☐	Completion Date (via calendar days)	April 1, 2008	
* 80199	12	☐	Completion Date (via calendar days) Plus Working Days	April 1, 2008	
80453	13	☐	Concrete Sealer	Nov. 1, 2023	
80261	14	☒	Construction Air Quality – Diesel Retrofit	June 1, 2010	Nov. 1, 2014
80434	15	☐	Corrugated Plastic Pipe (Culvert and Storm Sewer)	Jan. 1, 2021	
* 80029	16	☐	Disadvantaged Business Enterprise Participation	Sept. 1, 2000	Mar. 2, 2019
80229	17	☒	Fuel Cost Adjustment	April 1, 2009	Aug. 1, 2017
80452	18	☐	Full Lane Sealant Waterproofing System	Nov. 1, 2023	
80447	19	☐	Grading and Shaping Ditches	Jan. 1, 2023	
80433	20	☐	Green Preformed Thermoplastic Pavement Markings	Jan. 1, 2021	Jan. 1, 2022
80443	21	☐	High Tension Cable Median Barrier Removal	April 1, 2022	
80456	22	☐	Hot-Mix Asphalt	Jan. 1, 2024	
80446	23	☐	Hot-Mix Asphalt - Longitudinal Joint Sealant	Nov. 1, 2022	Aug. 1, 2023
80438	24	☐	Illinois Works Apprenticeship Initiative – State Funded Contracts	June 2, 2021	Sept. 2, 2021
80045	25	☐	Material Transfer Device	June 15, 1999	Jan. 1, 2022
80450	26	☐	Mechanically Stabilized Earth Retaining Walls	Aug. 1, 2023	
80441	27	☒	Performance Graded Asphalt Binder	Jan. 1, 2023	
80451	28	☐	Portland Cement Concrete	Aug. 1, 2023	
* 3426I	29	☐	Railroad Protective Liability Insurance	Dec. 1, 1986	Jan. 1, 2022
80455	30	☐	Removal and Disposal of Regulated Substances	Jan. 1, 2024	
80445	31	☒	Seeding	Nov. 1, 2022	
80448	32	☐	Source of Supply and Quality Requirements	Jan. 2, 2023	
80340	33	☐	Speed Display Trailer	April 2, 2014	Jan. 1, 2022
80127	34	☐	Steel Cost Adjustment	April 2, 2004	Jan. 1, 2022
80397	35	☒	Subcontractor and DBE Payment Reporting	April 2, 2018	
80391	36	☒	Subcontractor Mobilization Payments	Nov. 2, 2017	April 1, 2019
80437	37	☐	Submission of Payroll Records	April 1, 2021	Nov. 2, 2023
80435	38	☒	Surface Testing of Pavements – IRI	Jan. 1, 2021	Jan. 1, 2023
80410	39	☐	Traffic Spotters	Jan. 1, 2019	
* 20338	40	☐	Training Special Provisions	Oct. 15, 1975	Sept. 2, 2021
80429	41	☐	Ultra-Thin Bonded Wearing Course	April 1, 2020	Jan. 1, 2022
80439	42	☒	Vehicle and Equipment Warning Lights	Nov. 1, 2021	Nov. 1, 2022
80302	43	☒	Weekly DBE Trucking Reports	June 2, 2012	Nov. 1, 2021
80454	44	☐	Wood Sign Support	Nov. 1, 2023	
80427	45	☒	Work Zone Traffic Control Devices	Mar. 2, 2020	
* 80071	46	☐	Working Days	Jan. 1, 2002	

Highlighted items indicate a new or revised special provision for the letting.

An * indicates the special provision requires additional information from the designer, which needs to be submitted separately. The Project Coordination and Implementation Section will then include the information in the applicable special provision.

The following special provisions are in the 2024 Supplemental Specifications and Recurring Special Provisions.

File Name	Special Provision Title	New Location(s)	Effective	Revised
80436	Blended Finely Divided Minerals	Articles 1010.01 & 1010.06	April 1, 2021	
80440	Waterproofing Membrane System	Article 1061.05	Nov. 1, 2021	

AGGREGATE SUBGRADE IMPROVEMENT (BDE)

Effective: April 1, 2012
Revised: April 1, 2022

Add the following Section to the Standard Specifications:

"SECTION 303. AGGREGATE SUBGRADE IMPROVEMENT

303.01 Description. This work shall consist of constructing an aggregate subgrade improvement (ASI).

303.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Coarse Aggregate	1004.07
(b) Reclaimed Asphalt Pavement (RAP)	1031.09

303.03 Equipment. The vibratory roller shall be according to Article 1101.01, or as approved by the Engineer. Vibratory machines, such as tampers, shall be used in areas where rollers do not fit.

303.04 Soil Preparation. The minimum immediate bearing value (IBV) of the soil below the improved subgrade shall be according to the Department's "Subgrade Stability Manual" for the aggregate thickness specified.

303.05 Placing and Compacting. The maximum nominal lift thickness of aggregate gradations CA 2, CA 6, and CA 10 when compacted shall be 9 in. (225 mm). The maximum nominal lift thickness of aggregate gradations CS 1, CS 2, and RR 1 when compacted shall be 24 in. (600 mm).

The top surface of the aggregate subgrade improvement shall consist of a layer of capping aggregate gradations CA 6 or CA 10 that is 3 in. (75 mm) thick after compaction. Capping aggregate will not be required when aggregate subgrade improvement is used as a cubic yard pay item for undercut applications.

Each lift of aggregate shall be compacted to the satisfaction of the Engineer. If the moisture content of the material is such that compaction cannot be obtained, sufficient water shall be added so that satisfactory compaction can be obtained.

303.06 Finishing and Maintenance. The aggregate subgrade improvement shall be finished to the lines, grades, and cross sections shown on the plans, or as directed by the Engineer. The aggregate subgrade improvement shall be maintained in a smooth and compacted condition.

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

303.08 Basis of Payment. This work will be paid for at the contract unit price per cubic yard (cubic meter) or ton (metric ton) for AGGREGATE SUBGRADE IMPROVEMENT or at the contract unit price per square yard (square meter) for AGGREGATE SUBGRADE IMPROVEMENT, of the thickness specified."

Add the following to Section 1004 of the Standard Specifications:

"**1004.07 Coarse Aggregate for Aggregate Subgrade Improvement (ASI).** The aggregate shall be according to Article 1004.01 and the following.

(a) Description. The coarse aggregate shall be crushed gravel, crushed stone, or crushed concrete. In applications where greater than 24 in. (600 mm) of ASI material is required, gravel may be used below the top 12 in (300 mm) of ASI.

(b) Quality. The coarse aggregate shall consist of sound durable particles reasonably free of deleterious materials.

(c) Gradation.

(1) The coarse aggregate gradation for total ASI thickness less than or equal to 12 in. (300 mm) shall be CA 2, CA 6, CA 10, or CS 1.

The coarse aggregate gradation for total ASI thickness greater than 12 in. (300 mm) shall be CS 1 or CS 2 as shown below or RR 1 according to Article 1005.01(c).

	COARSE AGGREGATE SUBGRADE GRADATIONS				
Grad No.	Sieve Size and Percent Passing				
	8"	6"	4"	2"	#4
CS 1	100	97 ± 3	90 ± 10	45 ± 25	20 ± 20
CS 2		100	80 ± 10	25 ± 15	

	COARSE AGGREGATE SUBGRADE GRADATIONS (Metric)				
Grad No.	Sieve Size and Percent Passing				
	200 mm	150 mm	100 mm	50 mm	4.75 mm
CS 1	100	97 ± 3	90 ± 10	45 ± 25	20 ± 20
CS 2		100	80 ± 10	25 ± 15	

(2) Capping aggregate shall be gradation CA 6 or CA 10."

Add the following to Article 1031.09 of the Standard Specifications:

"(b) RAP in Aggregate Subgrade Improvement (ASI). RAP in ASI shall be according to Articles 1031.01(a), 1031.02(a), 1031.06(a)(1), and 1031.06(a)(2), and the following.

(1) The testing requirements of Article 1031.03 shall not apply.

(2) Crushed RAP used for the lower lift may be mechanically blended with aggregate gradations CS 1, CS 2, and RR 1 but it shall be no greater than 40 percent of the total product volume. RAP agglomerations shall be no greater than 4 in. (100 mm).

(3) For capping aggregate, well graded RAP having 100 percent passing the 1 1/2 in. (38 mm) sieve may be used when aggregate gradations CS 1, CS 2, CA 2, or RR 1 are used in the lower lift. FRAP will not be permitted as capping material.

Blending shall be through calibrated interlocked feeders or a calibrated blending plant such that the prescribed blending percentage is maintained throughout the blending process. The calibration shall have an accuracy of ± 2.0 percent of the actual quantity of material delivered."

80274

BITUMINOUS MATERIALS COST ADJUSTMENTS (BDE)

Effective: November 2, 2006
Revised: August 1, 2017

Description. Bituminous material cost adjustments will be made to provide additional compensation to the Contractor, or credit to the Department, for fluctuations in the cost of bituminous materials when optioned by the Contractor. The bidder shall indicate with their bid whether or not this special provision will be part of the contract.

The adjustments shall apply to permanent and temporary hot-mix asphalt (HMA) mixtures, bituminous surface treatments (cover and seal coats), and preventative maintenance type surface treatments that are part of the original proposed construction, or added as extra work and paid for by agreed unit prices. The adjustments shall not apply to bituminous prime coats, tack coats, crack filling/sealing, joint filling/sealing, or extra work paid for at a lump sum price or by force account.

Method of Adjustment. Bituminous materials cost adjustments will be computed as follows.

$CA = (BPI_P - BPI_L) \times (\%AC_V / 100) \times Q$

Where: CA = Cost Adjustment, $.
BPI_P = Bituminous Price Index, as published by the Department for the month the work is performed, $/ton ($/metric ton).
BPI_L = Bituminous Price Index, as published by the Department for the month prior to the letting for work paid for at the contract price; or for the month the agreed unit price letter is submitted by the Contractor for extra work paid for by agreed unit price, $/ton ($/metric ton).
$\%AC_V$ = Percent of virgin Asphalt Cement in the Quantity being adjusted. For HMA mixtures, the % AC_V will be determined from the adjusted job mix formula. For bituminous materials applied, a performance graded or cutback asphalt will be considered to be 100% AC_V and undiluted emulsified asphalt will be considered to be 65% AC_V.
Q = Authorized construction Quantity, tons (metric tons) (see below).

For HMA mixtures measured in square yards: Q, tons = A x D x (G_{mb} x 46.8) / 2000. For HMA mixtures measured in square meters: Q, metric tons = A x D x (G_{mb} x 1) / 1000. When computing adjustments for full-depth HMA pavement, separate calculations will be made for the binder and surface courses to account for their different G_{mb} and % AC_V.

For bituminous materials measured in gallons: Q, tons = V x 8.33 lb/gal x SG / 2000
For bituminous materials measured in liters: Q, metric tons = V x 1.0 kg/L x SG / 1000

Where: A = Area of the HMA mixture, sq yd (sq m).
D = Depth of the HMA mixture, in. (mm).
G_{mb} = Average bulk specific gravity of the mixture, from the approved mix design.

V = Volume of the bituminous material, gal (L).
SG = Specific Gravity of bituminous material as shown on the bill of lading.

Basis of Payment. Bituminous materials cost adjustments may be positive or negative but will only be made when there is a difference between the BPI_L and BPI_P in excess of five percent, as calculated by:

Percent Difference = $\{(BPI_L - BPI_P) \div BPI_L\} \times 100$

Bituminous materials cost adjustments will be calculated for each calendar month in which applicable bituminous material is placed; and will be paid or deducted when all other contract requirements for the work placed during the month are satisfied. The adjustments shall not apply during contract time subject to liquidated damages for completion of the entire contract.

80173

COMPENSABLE DELAY COSTS (BDE)

Effective: June 2, 2017
Revised: April 1, 2019

Revise Article 107.40(b) of the Standard Specifications to read:

"(b) Compensation. Compensation will not be allowed for delays, inconveniences, or damages sustained by the Contractor from conflicts with facilities not meeting the above definition; or if a conflict with a utility in an unanticipated location does not cause a shutdown of the work or a documentable reduction in the rate of progress exceeding the limits set herein. The provisions of Article 104.03 notwithstanding, compensation for delays caused by a utility in an unanticipated location will be paid according to the provisions of this Article governing minor and major delays or reduced rate of production which are defined as follows.

(1) Minor Delay. A minor delay occurs when the work in conflict with the utility in an unanticipated location is completely stopped for more than two hours, but not to exceed two weeks.

(2) Major Delay. A major delay occurs when the work in conflict with the utility in an unanticipated location is completely stopped for more than two weeks.

(3) Reduced Rate of Production Delay. A reduced rate of production delay occurs when the rate of production on the work in conflict with the utility in an unanticipated location decreases by more than 25 percent and lasts longer than seven calendar days."

Revise Article 107.40(c) of the Standard Specifications to read:

"(c) Payment. Payment for Minor, Major, and Reduced Rate of Production Delays will be made as follows.

(1) Minor Delay. Labor idled which cannot be used on other work will be paid for according to Article 109.04(b)(1) and (2) for the time between start of the delay and the minimum remaining hours in the work shift required by the prevailing practice in the area.

Equipment idled which cannot be used on other work, and which is authorized to standby on the project site by the Engineer, will be paid for according to Article 109.04(b)(4).

(2) Major Delay. Labor will be the same as for a minor delay.

Equipment will be the same as for a minor delay, except Contractor-owned equipment will be limited to two weeks plus the cost of move-out to either the

Contractor's yard or another job and the cost to re-mobilize, whichever is less. Rental equipment may be paid for longer than two weeks provided the Contractor presents adequate support to the Department (including lease agreement) to show retaining equipment on the job is the most economical course to follow and in the public interest.

(3) Reduced Rate of Production Delay. The Contractor will be compensated for the reduced productivity for labor and equipment time in excess of the 25 percent threshold for that portion of the delay in excess of seven calendar days. Determination of compensation will be in accordance with Article 104.02, except labor and material additives will not be permitted.

Payment for escalated material costs, escalated labor costs, extended project overhead, and extended traffic control will be determined according to Article 109.13."

Revise Article 108.04(b) of the Standard Specifications to read:

"(b) No working day will be charged under the following conditions.

(1) When adverse weather prevents work on the controlling item.

(2) When job conditions due to recent weather prevent work on the controlling item.

(3) When conduct or lack of conduct by the Department or its consultants, representatives, officers, agents, or employees; delay by the Department in making the site available; or delay in furnishing any items required to be furnished to the Contractor by the Department prevents work on the controlling item.

(4) When delays caused by utility or railroad adjustments prevent work on the controlling item.

(5) When strikes, lock-outs, extraordinary delays in transportation, or inability to procure critical materials prevent work on the controlling item, as long as these delays are not due to any fault of the Contractor.

(6) When any condition over which the Contractor has no control prevents work on the controlling item."

Revise Article 109.09(f) of the Standard Specifications to read:

"(f) Basis of Payment. After resolution of a claim in favor of the Contractor, any adjustment in time required for the work will be made according to Section 108. Any adjustment in the costs to be paid will be made for direct labor, direct materials, direct equipment, direct jobsite overhead, direct offsite overhead, and other direct costs allowed by the resolution. Adjustments in costs will not be made for interest charges, loss of anticipated profit, undocumented loss of efficiency, home office overhead and unabsorbed overhead

other than as allowed by Article 109.13, lost opportunity, preparation of claim expenses and other consequential indirect costs regardless of method of calculation.

The above Basis of Payment is an essential element of the contract and the claim cost recovery of the Contractor shall be so limited."

Add the following to Section 109 of the Standard Specifications.

"**109.13 Payment for Contract Delay.** Compensation for escalated material costs, escalated labor costs, extended project overhead, and extended traffic control will be allowed when such costs result from a delay meeting the criteria in the following table.

Contract Type	Cause of Delay	Length of Delay
Working Days	Article 108.04(b)(3) or Article 108.04(b)(4)	No working days have been charged for two consecutive weeks.
Completion Date	Article 108.08(b)(1) or Article 108.08(b)(7)	The Contractor has been granted a minimum two week extension of contract time, according to Article 108.08.

Payment for each of the various costs will be according to the following.

(a) Escalated Material and/or Labor Costs. When the delay causes work, which would have otherwise been completed, to be done after material and/or labor costs have increased, such increases will be paid. Payment for escalated material costs will be limited to the increased costs substantiated by documentation furnished by the Contractor. Payment for escalated labor costs will be limited to those items in Article 109.04(b)(1) and (2), except the 35 percent and 10 percent additives will not be permitted.

(b) Extended Project Overhead. For the duration of the delay, payment for extended project overhead will be paid as follows.

(1) Direct Jobsite and Offsite Overhead. Payment for documented direct jobsite overhead and documented direct offsite overhead, including onsite supervisory and administrative personnel, will be allowed according to the following table.

Original Contract Amount	Supervisory and Administrative Personnel
Up to $5,000,000	One Project Superintendent
Over $ 5,000,000 - up to $25,000,000	One Project Manager, One Project Superintendent or Engineer, and One Clerk
Over $25,000,000 - up to $50,000,000	One Project Manager, One Project Superintendent, One Engineer, and

	One Clerk
Over $50,000,000	One Project Manager, Two Project Superintendents, One Engineer, and One Clerk

(2) Home Office and Unabsorbed Overhead. Payment for home office and unabsorbed overhead will be calculated as 8 percent of the total delay cost.

(c) Extended Traffic Control. Traffic control required for an extended period of time due to the delay will be paid for according to Article 109.04.

When an extended traffic control adjustment is paid under this provision, an adjusted unit price as provided for in Article 701.20(a) for increase or decrease in the value of work by more than ten percent will not be paid.

Upon payment for a contract delay under this provision, the Contractor shall assign subrogation rights to the Department for the Department's efforts of recovery from any other party for monies paid by the Department as a result of any claim under this provision. The Contractor shall fully cooperate with the Department in its efforts to recover from another party any money paid to the Contractor for delay damages under this provision."

80384

CONSTRUCTION AIR QUALITY – DIESEL RETROFIT (BDE)

Effective: June 1, 2010
Revised: November 1, 2014

The reduction of emissions of particulate matter (PM) for off-road equipment shall be accomplished by installing retrofit emission control devices. The term "equipment" refers to diesel fuel powered devices rated at 50 hp and above, to be used on the jobsite in excess of seven calendar days over the course of the construction period on the jobsite (including rental equipment).

Contractor and subcontractor diesel powered off-road equipment assigned to the contract shall be retrofitted using the phased in approach shown below. Equipment that is of a model year older than the year given for that equipment's respective horsepower range shall be retrofitted:

Effective Dates	Horsepower Range	Model Year
June 1, 2010 1/	600-749	2002
	750 and up	2006
June 1, 2011 2/	100-299	2003
	300-599	2001
	600-749	2002
	750 and up	2006
June 1, 2012 2/	50-99	2004
	100-299	2003
	300-599	2001
	600-749	2002
	750 and up	2006

1/ Effective dates apply to Contractor diesel powered off-road equipment assigned to the contract.

2/ Effective dates apply to Contractor and subcontractor diesel powered off-road equipment assigned to the contract.

The retrofit emission control devices shall achieve a minimum PM emission reduction of 50 percent and shall be:

a) Included on the U.S. Environmental Protection Agency (USEPA) *Verified Retrofit Technology List* (http://www.epa.gov/cleandiesel/verification/verif-list.htm), or verified by the California Air Resources Board (CARB) (http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm); or

b) Retrofitted with a non-verified diesel retrofit emission control device if verified retrofit emission control devices are not available for equipment proposed to be used on the project, and if the Contractor has obtained a performance certification from the retrofit

device manufacturer that the emission control device provides a minimum PM emission reduction of 50 percent.

Note: Large cranes (Crawler mounted cranes) which are responsible for critical lift operations are exempt from installing retrofit emission control devices if such devices adversely affect equipment operation.

Diesel powered off-road equipment with engine ratings of 50 hp and above, which are unable to be retrofitted with verified emission control devices or if performance certifications are not available which will achieve a minimum 50 percent PM reduction, may be granted a waiver by the Department if documentation is provided showing good faith efforts were made by the Contractor to retrofit the equipment.

Construction shall not proceed until the Contractor submits a certified list of the diesel powered off-road equipment that will be used, and as necessary, retrofitted with emission control devices. The list(s) shall include (1) the equipment number, type, make, Contractor/rental company name; and (2) the emission control devices make, model, USEPA or CARB verification number, or performance certification from the retrofit device manufacturer. Equipment reported as fitted with emissions control devices shall be made available to the Engineer for visual inspection of the device installation, prior to being used on the jobsite.

The Contractor shall submit an updated list of retrofitted off-road construction equipment as retrofitted equipment changes or comes on to the jobsite. The addition or deletion of any diesel powered equipment shall be included on the updated list.

If any diesel powered off-road equipment is found to be in non-compliance with any portion of this special provision, the Engineer will issue the Contractor a diesel retrofit deficiency deduction.

Any costs associated with retrofitting any diesel powered off-road equipment with emission control devices shall be considered as included in the contract unit prices bid for the various items of work involved and no additional compensation will be allowed. The Contractor's compliance with this notice and any associated regulations shall not be grounds for a claim.

Diesel Retrofit Deficiency Deduction

When the Engineer determines that a diesel retrofit deficiency exists, a daily monetary deduction will be imposed for each calendar day or fraction thereof the deficiency continues to exist. The calendar day(s) will begin when the time period for correction is exceeded and end with the Engineer's written acceptance of the correction. The daily monetary deduction will be $1,000.00 for each deficiency identified.

The deficiency will be based on lack of diesel retrofit emissions control.

If a Contractor accumulates three diesel retrofit deficiency deductions for the same piece of equipment in a contract period, the Contractor will be shutdown until the deficiency is corrected.

Such a shutdown will not be grounds for any extension of the contract time, waiver of penalties, or be grounds for any claim.

80261

FUEL COST ADJUSTMENT (BDE)

Effective: April 1, 2009
Revised: August 1, 2017

Description. Fuel cost adjustments will be made to provide additional compensation to the Contractor, or a credit to the Department, for fluctuations in fuel prices when optioned by the Contractor. The bidder shall indicate with their bid whether or not this special provision will be part of the contract. Failure to indicate "Yes" for any category of work will make that category of work exempt from fuel cost adjustment.

General. The fuel cost adjustment shall apply to contract pay items as grouped by category. The adjustment shall only apply to those categories of work checked "Yes", and only when the cumulative plan quantities for a category exceed the required threshold. Adjustments to work items in a category, either up or down, and extra work paid for by agreed unit price will be subject to fuel cost adjustment only when the category representing the added work was subject to the fuel cost adjustment. Extra work paid for at a lump sum price or by force account will not be subject to fuel cost adjustment. Category descriptions and thresholds for application and the fuel usage factors which are applicable to each are as follows:

(a) Categories of Work.

(1) Category A: Earthwork. Contract pay items performed under Sections 202, 204, and 206 including any modified standard or nonstandard items where the character of the work to be performed is considered earthwork. The cumulative total of all applicable item plan quantities shall exceed 25,000 cu yd (20,000 cu m). Included in the fuel usage factor is a weighted average 0.10 gal/cu yd (0.50 liters/cu m) factor for trucking.

(2) Category B: Subbases and Aggregate Base Courses. Contract pay items constructed under Sections 311, 312 and 351 including any modified standard or nonstandard items where the character of the work to be performed is considered construction of a subbase or aggregate, stabilized or modified base course. The cumulative total of all applicable item plan quantities shall exceed 5000 tons (4500 metric tons). Included in the fuel usage factor is a 0.60 gal/ton (2.50 liters/metric ton) factor for trucking.

(3) Category C: Hot-Mix Asphalt (HMA) Bases, Pavements and Shoulders. Contract pay items constructed under Sections 355, 406, 407 and 482 including any modified standard or nonstandard items where the character of the work to be performed is considered HMA bases, pavements and shoulders. The cumulative total of all applicable item plan quantities shall exceed 5000 tons (4500 metric tons). Included in the fuel usage factor is 0.60 gal/ton (2.50 liters/metric ton) factor for trucking.

(4) Category D: Portland Cement Concrete (PCC) Bases, Pavements and Shoulders. Contract pay items constructed under Sections 353, 420, 421 and 483 including any

modified standard or nonstandard items where the character of the work to be performed is considered PCC base, pavement or shoulder. The cumulative total of all applicable item plan quantities shall exceed 7500 sq yd (6000 sq m). Included in the fuel usage factor is 1.20 gal/cu yd (5.94 liters/cu m) factor for trucking.

(5) Category E: Structures. Structure items having a cumulative bid price that exceeds $250,000 for pay items constructed under Sections 502, 503, 504, 505, 512, 516 and 540 including any modified standard or nonstandard items where the character of the work to be performed is considered structure work when similar to that performed under these sections and not included in categories A through D.

(b) Fuel Usage Factors.

English Units

Category	Factor	Units
A - Earthwork	0.34	gal / cu yd
B – Subbase and Aggregate Base courses	0.62	gal / ton
C – HMA Bases, Pavements and Shoulders	1.05	gal / ton
D – PCC Bases, Pavements and Shoulders	2.53	gal / cu yd
E – Structures	8.00	gal / $1000

Metric Units

Category	Factor	Units
A - Earthwork	1.68	liters / cu m
B – Subbase and Aggregate Base courses	2.58	liters / metric ton
C – HMA Bases, Pavements and Shoulders	4.37	liters / metric ton
D – PCC Bases, Pavements and Shoulders	12.52	liters / cu m
E – Structures	30.28	liters / $1000

(c) Quantity Conversion Factors.

Category	Conversion	Factor
B	sq yd to ton	0.057 ton / sq yd / in depth
	sq m to metric ton	0.00243 metric ton / sq m / mm depth
C	sq yd to ton	0.056 ton / sq yd / in depth
	sq m to metric ton	0.00239 m ton / sq m / mm depth
D	sq yd to cu yd	0.028 cu yd / sq yd / in depth
	sq m to cu m	0.001 cu m / sq m / mm depth

Method of Adjustment. Fuel cost adjustments will be computed as follows.

$CA = (FPI_P - FPI_L) \times FUF \times Q$

Where: CA = Cost Adjustment, $

FPI_P = Fuel Price Index, as published by the Department for the month the work is performed, $/gal ($/liter)

FPI_L = Fuel Price Index, as published by the Department for the month prior to the letting for work paid for at the contract price; or for the month the agreed unit price letter is submitted by the Contractor for extra work paid for by agreed unit price, $/gal ($/liter)

FUF = Fuel Usage Factor in the pay item(s) being adjusted

Q = Authorized construction Quantity, tons (metric tons) or cu yd (cu m)

The entire FUF indicated in paragraph (b) will be used regardless of use of trucking to perform the work.

Basis of Payment. Fuel cost adjustments may be positive or negative but will only be made when there is a difference between the FPI_L and FPI_P in excess of five percent, as calculated by:

$$\text{Percent Difference} = \{(FPI_L - FPI_P) \div FPI_L\} \times 100$$

Fuel cost adjustments will be calculated for each calendar month in which applicable work is performed; and will be paid or deducted when all other contract requirements for the items of work are satisfied. The adjustments shall not apply during contract time subject to liquidated damages for completion of the entire contract.

80229

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, ΔTc, 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, ΔTc, 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, Δ|G*|peak τ, 40 hrs PAV (40 hrs continuous or 2 PAV at 20 hrs)	≥ 54 %

The following grades may be specified as tack coats.

Asphalt Grade	Use
PG 58-22, PG 58-28, PG 64-22	Tack Coat"

Revise Article 1031.06(c)(1) and 1031.06(c)(2) of the Standard Specifications to read:

"(1) RAP/RAS. When RAP is used alone or RAP is used in conjunction with RAS, the percentage of virgin ABR shall not exceed the amounts listed in the following table.

HMA Mixtures - RAP/RAS Maximum ABR % 1/ 2/			
Ndesign	Binder	Surface	Polymer Modified Binder or Surface 3/
30	30	30	10
50	25	15	10
70	15	10	10
90	10	10	10

1/ For Low ESAL HMA shoulder and stabilized subbase, the RAP/RAS ABR shall not exceed 50 percent of the mixture.

2/ When RAP/RAS ABR exceeds 20 percent, the high and low virgin asphalt binder grades shall each be reduced by one grade (i.e. 25 percent ABR would require a virgin asphalt binder grade of PG 64-22 to be reduced to a PG 58-28).

3/ The maximum ABR percentages for ground tire rubber (GTR) modified mixes shall be equivalent to the percentages specified for SBS/SBR polymer modified mixes.

(2) FRAP/RAS. When FRAP is used alone or FRAP is used in conjunction with RAS, the percentage of virgin asphalt binder replacement shall not exceed the amounts listed in the following table.

HMA Mixtures - FRAP/RAS Maximum ABR % 1/ 2/			
Ndesign	Binder	Surface	Polymer Modified Binder or Surface 3/
30	55	45	15
50	45	40	15
70	45	35	15
90	45	35	15
SMA	- -	- -	25
IL-4.75	- -	- -	35

1/ For Low ESAL HMA shoulder and stabilized subbase, the FRAP/RAS ABR shall not exceed 50 percent of the mixture.

2/ When FRAP/RAS ABR exceeds 20 percent for all mixes, the high and low virgin asphalt binder grades shall each be reduced by one grade (i.e. 25 percent ABR would require a virgin asphalt binder grade of PG 64-22 to be reduced to a PG 58-28).

3/ The maximum ABR percentages for GTR modified mixes shall be equivalent to the percentages specified for SBS/SBR polymer modified mixes."

Add the following to the end of Note 2 of Article 1030.03 of the Standard Specifications.

"A dedicated storage tank for the ground tire rubber (GTR) modified asphalt binder shall be provided. This tank shall be capable of providing continuous mechanical mixing throughout and/or recirculation of the asphalt binder to provide a uniform mixture. The tank shall be heated and capable of maintaining the temperature of the asphalt binder at 300 °F to 350 °F (149 °C to 177 °C). The asphalt binder metering systems of dryer drum plants shall be calibrated with the actual GTR modified asphalt binder material with an accuracy of ±0.40 percent."

80441

SEEDING (BDE)

Effective: November 1, 2022

Revise Article 250.07 of the Standard Specifications to read:

"**250.07 Seeding Mixtures.** The classes of seeding mixtures and combinations of mixtures will be designated in the plans.

When an area is to be seeded with two or more seeding classes, those mixtures shall be applied separately on the designated area within a seven day period. Seeding shall occur prior to placement of mulch cover. A Class 7 mixture can be applied at any time prior to applying any seeding class or added to them and applied at the same time.

TABLE 1 - SEEDING MIXTURES			
Class - Type		Seeds	lb/acre (kg/hectare)
1	Lawn Mixture 1/	Kentucky Bluegrass	100 (110)
		Perennial Ryegrass	60 (70)
		Festuca rubra ssp. *rubra* (Creeping Red Fescue)	40 (50)
1A	Salt Tolerant Lawn Mixture 1/	Kentucky Bluegrass	60 (70)
		Perennial Ryegrass	20 (20)
		Festuca rubra ssp. *rubra* (Creeping Red Fescue)	20 (20)
		Festuca brevipilla (Hard Fescue)	20 (20)
		Puccinellia distans (Fults Saltgrass or Salty Alkaligrass)	60 (70)
1B	Low Maintenance Lawn Mixture 1/	Turf-Type Fine Fescue 3/	150 (170)
		Perennial Ryegrass	20 (20)
		Red Top	10 (10)
		Festuca rubra ssp. *rubra* (Creeping Red Fescue)	20 (20)
2	Roadside Mixture 1/	*Lolium arundinaceum* (Tall Fescue)	100 (110)
		Perennial Ryegrass	50 (55)
		Festuca rubra ssp. *rubra* (Creeping Red Fescue)	40 (50)
		Red Top	10 (10)
2A	Salt Tolerant Roadside Mixture 1/	*Lolium arundinaceum* (Tall Fescue)	60 (70)
		Perennial Ryegrass	20 (20)
		Festuca rubra ssp. *rubra* (Creeping Red Fescue)	30 (20)
		Festuca brevipila (Hard Fescue)	30 (20)
		Puccinellia distans (Fults Saltgrass or Salty Alkaligrass)	60 (70)
3	Northern Illinois Slope Mixture 1/	*Elymus canadensis* (Canada Wild Rye) 5/	5 (5)
		Perennial Ryegrass	20 (20)
		Alsike Clover 4/	5 (5)
		Desmanthus illinoensis (Illinois Bundleflower) 4/ 5/	2 (2)
		Schizachyrium scoparium (Little Bluestem) 5/	12 (12)
		Bouteloua curtipendula (Side-Oats Grama) 5/	10 (10)
		Puccinellia distans (Fults Saltgrass or Salty Alkaligrass)	30 (35)
		Oats, Spring	50 (55)
		Slender Wheat Grass 5/	15 (15)
		Buffalo Grass 5/ 7/	5 (5)
3A	Southern Illinois Slope Mixture 1/	Perennial Ryegrass	20 (20)
		Elymus canadensis (Canada Wild Rye) 5/	20 (20)
		Panicum virgatum (Switchgrass) 5/	10 (10)
		Schizachyrium scoparium (Little Blue Stem) 5/	12 (12)
		Bouteloua curtipendula (Side-Oats Grama) 5/	10 (10)
		Dalea candida (White Prairie Clover) 4/ 5/	5 (5)
		Rudbeckia hirta (Black-Eyed Susan) 5/	5 (5)
		Oats, Spring	50 (55)

Class – Type		Seeds	lb/acre (kg/hectare)
4	Native Grass 2/ 6/	*Andropogon gerardi* (Big Blue Stem) 5/	4 (4)
		Schizachyrium scoparium (Little Blue Stem) 5/	5 (5)
		Bouteloua curtipendula (Side-Oats Grama) 5/	5 (5)
		Elymus canadensis (Canada Wild Rye) 5/	1 (1)
		Panicum virgatum (Switch Grass) 5/	1 (1)
		Sorghastrum nutans (Indian Grass) 5/	2 (2)
		Annual Ryegrass	25 (25)
		Oats, Spring	25 (25)
		Perennial Ryegrass	15 (15)
4A	Low Profile Native Grass 2/ 6/	*Schizachyrium scoparium* (Little Blue Stem) 5/	5 (5)
		Bouteloua curtipendula (Side-Oats Grama) 5/	5 (5)
		Elymus canadensis (Canada Wild Rye) 5/	1 (1)
		Sporobolus heterolepis (Prairie Dropseed) 5/	0.5 (0.5)
		Annual Ryegrass	25 (25)
		Oats, Spring	25 (25)
		Perennial Ryegrass	15 (15)
4B	Wetland Grass and Sedge Mixture 2/ 6/	Annual Ryegrass	25 (25)
		Oats, Spring	25 (25)
		Wetland Grasses (species below) 5/	6 (6)

Species:	% By Weight
Calamagrostis canadensis (Blue Joint Grass)	12
Carex lacustris (Lake-Bank Sedge)	6
Carex slipata (Awl-Fruited Sedge)	6
Carex stricta (Tussock Sedge)	6
Carex vulpinoidea (Fox Sedge)	6
Eleocharis acicularis (Needle Spike Rush)	3
Eleocharis obtusa (Blunt Spike Rush)	3
Glyceria striata (Fowl Manna Grass)	14
Juncus effusus (Common Rush)	6
Juncus tenuis (Slender Rush)	6
Juncus torreyi (Torrey's Rush)	6
Leersia oryzoides (Rice Cut Grass)	10
Scirpus acutus (Hard-Stemmed Bulrush)	3
Scirpus atrovirens (Dark Green Rush)	3
Bolboschoenus fluviatilis (River Bulrush)	3
Schoenoplectus tabernaemontani (Softstem Bulrush)	3
Spartina pectinata (Cord Grass)	4

Class – Type		Seeds	lb/acre (kg/hectare)
5	Forb with Annuals Mixture 2/ 5/ 6/	Annuals Mixture (Below)	1 (1)
		Forb Mixture (Below)	10 (10)

Annuals Mixture - Mixture not exceeding 25 % by weight of any one species, of the following:

Coreopsis lanceolata (Sand Coreopsis)
Leucanthemum maximum (Shasta Daisy)
Gaillardia pulchella (Blanket Flower)
Ratibida columnifera (Prairie Coneflower)
Rudbeckia hirta (Black-Eyed Susan)

Forb Mixture - Mixture not exceeding 5 % by weight PLS of any one species, of the following:

Amorpha canescens (Lead Plant) 4/
Anemone cylindrica (Thimble Weed)
Asclepias tuberosa (Butterfly Weed)
Aster azureus (Sky Blue Aster)
Symphyotrichum leave (Smooth Aster)
Aster novae-angliae (New England Aster)
Baptisia leucantha (White Wild Indigo) 4/
Coreopsis palmata (Prairie Coreopsis)
Echinacea pallida (Pale Purple Coneflower)
Eryngium yuccifolium (Rattlesnake Master)
Helianthus mollis (Downy Sunflower)
Heliopsis helianthoides (Ox-Eye)
Liatris aspera (Rough Blazing Star)
Liatris pycnostachya (Prairie Blazing Star)
Monarda fistulosa (Prairie Bergamot)
Parthenium integrifolium (Wild Quinine)
Dalea candida (White Prairie Clover) 4/
Dalea purpurea (Purple Prairie Clover) 4/
Physostegia virginiana (False Dragonhead)
Potentilla arguta (Prairie Cinquefoil)
Ratibida pinnata (Yellow Coneflower)
Rudbeckia subtomentosa (Fragrant Coneflower)
Silphium laciniatum (Compass Plant)
Silphium terebinthinaceum (Prairie Dock)
Oligoneuron rigidum (Rigid Goldenrod)
Tradescantia ohiensis (Spiderwort)
Veronicastrum virginicum (Culver's Root)

Class – Type		Seeds	lb/acre (kg/hectare)
5A	Large Flower Native Forb Mixture 2/ 5/ 6/	Forb Mixture (see below)	5 (5)
	Species:		% By Weight
	Aster novae-angliae (New England Aster)		5
	Echinacea pallida (Pale Purple Coneflower)		10
	Helianthus mollis (Downy Sunflower)		10
	Heliopsis helianthoides (Ox-Eye)		10
	Liatris pycnostachya (Prairie Blazing Star)		10
	Ratibida pinnata (Yellow Coneflower)		5
	Rudbeckia hirta (Black-Eyed Susan)		10
	Silphium laciniatum (Compass Plant)		10
	Silphium terebinthinaceum (Prairie Dock)		20
	Oligoneuron rigidum (Rigid Goldenrod)		10
5B	Wetland Forb 2/ 5/ 6/	Forb Mixture (see below)	2 (2)
	Species:		% By Weight
	Acorus calamus (Sweet Flag)		3
	Angelica atropurpurea (Angelica)		6
	Asclepias incarnata (Swamp Milkweed)		2
	Aster puniceus (Purple Stemmed Aster)		10
	Bidens cernua (Beggarticks)		7
	Eutrochium maculatum (Spotted Joe Pye Weed)		7
	Eupatorium perfoliatum (Boneset)		7
	Helenium autumnale (Autumn Sneeze Weed)		2
	Iris virginica shrevei (Blue Flag Iris)		2
	Lobelia cardinalis (Cardinal Flower)		5
	Lobelia siphilitica (Great Blue Lobelia)		5
	Lythrum alatum (Winged Loosestrife)		2
	Physostegia virginiana (False Dragonhead)		5
	Persicaria pensylvanica (Pennsylvania Smartweed)		10
	Persicaria lapathifolia (Curlytop Knotweed)		10
	Pychanthemum virginianum (Mountain Mint)		5
	Rudbeckia laciniata (Cut-leaf Coneflower)		5
	Oligoneuron riddellii (Riddell Goldenrod)		2
	Sparganium eurycarpum (Giant Burreed)		5
6	Conservation Mixture 2/ 6/	*Schizachyrium scoparium* (Little Blue Stem) 5/	5 (5)
		Elymus canadensis (Canada Wild Rye) 5/	2 (2)
		Buffalo Grass 5/ 7/	5 (5)
		Vernal Alfalfa 4/	15 (15)
		Oats, Spring	48 (55)
6A	Salt Tolerant Conservation Mixture 2/ 6/	*Schizachyrium scoparium* (Little Blue Stem) 5/	5 (5)
		Elymus canadensis (Canada Wild Rye) 5/	2 (2)
		Buffalo Grass 5/ 7/	5 (5)
		Vernal Alfalfa 4/	15 (15)
		Oats, Spring	48 (55)
		Puccinellia distans (Fults Saltgrass or Salty Alkaligrass)	20 (20)
7	Temporary Turf Cover Mixture	Perennial Ryegrass	50 (55)
		Oats, Spring	64 (70)

Notes:

1/ Seeding shall be performed when the ambient temperature has been between 45 ºF (7 ºC) and 80 ºF (27 ºC) for a minimum of seven (7) consecutive days and is forecasted to be the same for the next five (5) days according to the National Weather Service.
2/ Seeding shall be performed in late fall through spring beginning when the ambient temperature has been below 45 ºF (7 ºC) for a minimum of seven (7) consecutive days and ending when the ambient temperature exceeds 80 ºF (27 ºC) according to the National Weather Service.
3/ Specific variety as shown in the plans or approved by the Engineer.
4/ Inoculation required.
5/ Pure Live Seed (PLS) shall be used.
6/ Fertilizer shall not be used.
7/ Seed shall be primed with KNO_3 to break dormancy and dyed to indicate such.

Seeding will be inspected after a period of establishment. The period of establishment shall be six (6) months minimum, but not to exceed nine (9) months. After the period of establishment, areas not exhibiting 75 percent uniform growth shall be interseeded or reseeded, as determined by the Engineer, at no additional cost to the Department."

80445

SUBCONTRACTOR AND DBE PAYMENT REPORTING (BDE)

Effective: April 2, 2018

Add the following to Section 109 of the Standard Specifications.

"**109.14 Subcontractor and Disadvantaged Business Enterprise Payment Reporting.** The Contractor shall report all payments made to the following parties:

(a) first tier subcontractors;

(b) lower tier subcontractors affecting disadvantaged business enterprise (DBE) goal credit;

(c) material suppliers or trucking firms that are part of the Contractor's submitted DBE utilization plan.

The report shall be made through the Department's on-line subcontractor payment reporting system within 21 days of making the payment."

80397

SUBCONTRACTOR MOBILIZATION PAYMENTS (BDE)

Effective: November 2, 2017
Revised: April 1, 2019

Replace the second paragraph of Article 109.12 of the Standard Specifications with the following:

"This mobilization payment shall be made at least seven days prior to the subcontractor starting work. The amount paid shall be at the following percentage of the amount of the subcontract reported on form BC 260A submitted for the approval of the subcontractor's work.

Value of Subcontract Reported on Form BC 260A	Mobilization Percentage
Less than $10,000	25%
$10,000 to less than $20,000	20%
$20,000 to less than $40,000	18%
$40,000 to less than $60,000	16%
$60,000 to less than $80,000	14%
$80,000 to less than $100,000	12%
$100,000 to less than $250,000	10%
$250,000 to less than $500,000	9%
$500,000 to $750,000	8%
Over $750,000	7%"

80391

SURFACE TESTING OF PAVEMENTS – IRI (BDE)

Effective: January 1, 2021
Revised: January 1, 2023

Description. This work shall consist of testing the ride quality of the finished surface of pavement sections with new concrete pavement, PCC overlays, full-depth HMA, and HMA overlays with at least 2.25 in. (57 mm) total thickness of new HMA combined with either HMA binder or HMA surface removal, according to Illinois Test Procedure 701, "Ride Quality Testing Using the International Roughness Index (IRI)". Work shall be according to Sections 406, 407, or 420 of the Standard Specifications, except as modified herein.

Hot-Mix Asphalt (HMA) Overlays

Add the following to Article 406.03 of the Standard Specifications:

"(n) Pavement Surface Grinding Equipment.....1101.04"

Revise Article 406.11 of the Standard Specifications to read:

"**406.11 Surface Tests.** Prior to HMA overlay pavement improvements, the Engineer will measure the smoothness of the existing high-speed mainline pavement. The Contractor shall measure the smoothness of the finished high-speed mainline, low-speed mainline, and miscellaneous pavements after the pavement improvement is complete but within the same construction season. Testing shall be performed in the presence of the Engineer and according to Illinois Test Procedure 701. The pavement will be identified as high-speed mainline, low-speed mainline, or miscellaneous as follows.

(a) Test Sections.

(1) High-Speed Mainline Pavement. High-speed mainline pavement consists of pavements, ramps, and loops with a posted speed limit greater than 45 mph. These sections shall be tested with an inertial profiling system (IPS).

(2) Low-Speed Mainline Pavement. Low-speed mainline pavement consists of pavements, ramps, and loops with a posted speed limit of 45 mph or less. These sections shall be tested using a 16 ft (5 m) straightedge or with an IPS analyzed using the rolling 16 ft (5 m) straightedge simulation in ProVAL.

(3) Miscellaneous Pavement. Miscellaneous pavement are segments that either cannot readily be tested by an IPS or conditions beyond the control of the Contractor preclude the achievement of smoothness levels typically achievable with mainline pavement construction. This may include the following examples or as determined by the Engineer.

a. Pavement on horizontal curves with a centerline radius of curvature of less than or equal to 1,000 ft (300 m) and the pavement within the superelevation transition of such curves;

b. Pavement on vertical curves having a length less than or equal to 200 ft (60 m) in combination with an algebraic change in tangent grade greater than or equal to 3 percent as may occur on urban ramps or other constricted-space facilities;

c. The first and last 50 ft (15 m) of a pavement section where the Contractor is not responsible for the adjoining surface;

d. Intersections and the 25 ft (7.6 m) before and after an intersection or end of radius return;

e. Variable width pavements;

f. Side street returns, to the end of radius return;

g. Crossovers;

h. Pavement connector for bridge approach slab;

i. Bridge approach slab;

j. Pavement that must be constructed in segments of 600 ft (180 m) or less;

k. Pavement within 25 ft (7.6 m) of manholes, utility structures, at-grade railroad crossings, or other appurtenances;

l. Turn lanes; and

m. Pavement within 5 ft (1.5 m) of jobsite sampling locations for HMA volumetric testing that fall within the wheel path.

Miscellaneous pavement shall be tested using a 16 ft (5 m) straightedge.

(4) International Roughness Index (IRI). An index computed from a longitudinal profile measurement using a quarter-car simulation at a simulation speed of 50 mph (80 km/h).

(5) Mean Roughness Index (MRI). The average of the IRI values for the right and left wheel tracks.

a. MRI_O. The MRI of the existing pavement prior to construction.

b. MRI_I. The MRI value that warrants an incentive payment.

c. MRI_F. The MRI value that warrants full payment.

d. MRI_D. The MRI value that warrants a financial disincentive.

(6) Areas of Localized Roughness (ALR). Isolated areas of roughness, which can cause significant increase in the calculated MRI for a given sublot.

(7) Sublot. A continuous strip of pavement 0.1 mile (160 m) long and one lane wide. A partial sublot greater than or equal to 264 ft (80 m) will be subject to the same evaluation as a whole sublot. Partial sublots less than 264 ft (80 m) shall be included with the previous sublot for evaluation purposes.

(b) Corrective Work. Corrective work shall be completed according to the following.

(1) High-Speed Mainline Pavement. For high-speed mainline pavement, any 25 ft (7.6 m) interval with an ALR in excess of 200 in./mile (3,200 mm/km) will be identified by the Engineer and shall be corrected by the Contractor. Any sublot having a MRI greater than MRI_D, including ALR, shall be corrected to reduce the MRI to the MRI_F, or replaced at the Contractor's option.

(2) Low-Speed Mainline Pavement. Surface variations in low-speed mainline pavement which exceed the 5/16 in. (8 mm) tolerance will be identified by the Engineer and shall be corrected by the Contractor.

(3) Miscellaneous Pavements. Surface variations in miscellaneous pavement which exceed the 5/16 in. (8 mm) tolerance will be identified by the Engineer and shall be corrected by the Contractor.

Corrective work shall be completed with pavement surface grinding equipment or by removing and replacing the pavement. Corrective work shall be applied to the full lane width. When completed, the corrected area shall have uniform texture and appearance, with the beginning and ending of the corrected area perpendicular to the centerline of the paved surface.

Upon completion of the corrective work, the surface of the sublot(s) shall be retested. The Contractor shall furnish the data and reports to the Engineer within 2 working days after corrections are made. If the MRI and/or ALR still do not meet the requirements, additional corrective work shall be performed.

Corrective work shall be at no additional cost to the Department.

(c) Smoothness Assessments. Assessments will be paid to or deducted from the Contractor for each sublot of high-speed mainline pavement per the Smoothness Assessment Schedule. Assessments will be based on the MRI of each sublot prior to performing any corrective work unless the Contractor has chosen to remove and replace the pavement.

For pavement that is replaced, assessments will be based on the MRI determined after replacement.

The upper MRI thresholds for high-speed mainline pavement are dependent on the MRI of the existing pavement before construction (MRI_0) and shall be determined as follows.

Upper MRI Thresholds [1/]	MRI Thresholds (High-Speed, HMA Overlay)	
	$MRI_0 \leq 125.0$ in./mile (≤ 1,975 mm/km)	$MRI_0 > 125.0$ in./mile [1/] (> 1,975 mm/km)
Incentive (MRI_I)	45.0 in./mile (710 mm/km)	$0.2 \times MRI_0 + 20$
Full Pay (MRI_F)	75.0 in./mile (1,190 mm/km)	$0.2 \times MRI_0 + 50$
Disincentive (MRI_D)	100.0 in./mile (1,975 mm/km)	$0.2 \times MRI_0 + 75$

1/ MRI_0, MRI_I, MRI_F, and MRI_D shall be in in./mile for calculation.

Smoothness assessments for high-speed mainline pavement shall be determined as follows.

SMOOTHNESS ASSESSMENT SCHEDULE (High-Speed, HMA Overlay)	
Mainline Pavement MRI Range	Assessment Per Sublot [1/]
$MRI \leq MRI_I$	$+ (MRI_I - MRI) \times \$20.00$ [2/]
$MRI_I < MRI \leq MRI_F$	+ \$0.00
$MRI_F < MRI \leq MRI_D$	$- (MRI - MRI_F) \times \$8.00$
$MRI > MRI_D$	– \$200.00

1/ MRI, MRI_I, MRI_F, and MRI_D shall be in in./mile for calculation.

2/ The maximum incentive amount shall not exceed \$300.00.

Smoothness assessments will not be paid or deducted until all other contract requirements for the pavement are satisfied. Pavement that is corrected or replaced for reasons other than smoothness, shall be retested as stated herein."

Hot-Mix Asphalt (HMA) Pavement (Full-Depth)

Revise the first paragraph of Article 407.03 of the Standard Specifications to read:

"**407.03 Equipment.** Equipment shall be according to Article 406.03."

Revise Article 407.09 of the Standard Specifications to read:

"**407.09 Surface Tests.** The finished surface of the pavement shall be tested for smoothness

according to Article 406.11, except as follows:

The testing of the existing pavement prior to improvements shall not apply and the smoothness assessment for high-speed mainline pavement shall be determined according to the following table.

SMOOTHNESS ASSESSMENT SCHEDULE (High-Speed, Full-Depth HMA)	
Mainline Pavement MRI, in./mile (mm/km)	Assessment Per Sublot [1/]
≤ 45.0 (710)	+ (45 – MRI) × $45.00 [2/]
> 45.0 (710) to 75.0 (1,190)	+ $0.00
> 75.0 (1,190) to 100.0 (1,580)	– (MRI – 75) × $20.00
> 100.0 (1,580)	– $500.00

1/ MRI shall be in in./mile for calculation.

2/ The maximum incentive amount shall not exceed $800.00."

Portland Cement Concrete Pavement

Delete Article 420.03(i) of the Standard Specifications.

Revise Article 420.10 of the Standard Specifications to read:

"**420.10 Surface Tests.** The finished surface of the pavement shall be tested for smoothness according to Article 406.11, except as follows.

The testing of the existing pavement prior to improvements shall not apply. The Contractor shall measure the smoothness of the finished surface of the pavement after the pavement has attained a flexural strength of 250 psi (3,800 kPa) or a compressive strength of 1,600 psi (20,700 kPa).

Membrane curing damaged during testing shall be repaired as directed by the Engineer at no additional cost to the Department.

(a) Corrective Work. No further texturing for skid resistance will be required for areas corrected by grinding. Protective coat shall be reapplied to areas ground according to Article 420.18 at no additional cost to the Department.

Jointed portland cement concrete pavement corrected by removal and replacement, shall be corrected in full panel sizes.

(b) Smoothness Assessments. Smoothness assessment for high-speed mainline pavement shall be determined as follows.

SMOOTHNESS ASSESSMENT SCHEDULE (High-Speed, PCC)	
Mainline Pavement MRI, in./mile (mm/km) [3/]	Assessment Per Sublot [1/]
≤ 45.0 (710)	+ (45 – MRI) × $60.00 [2/]
> 45.0 (710) to 75.0 (1,190)	+ $0.00
> 75.0 (1,190) to 100.0 (1,580)	– (MRI – 75) × $37.50
> 100.0 (1,580)	– $750.00

1/ MRI shall be in in./mile for calculation.

2/ The maximum incentive amount shall not exceed $1200.00.

3/ If pavement is constructed with traffic in the lane next to it, then an additional 10 in./mile will be added to the upper thresholds."

Removal of Existing Pavement and Appurtenances

Revise the first paragraph of Article 440.04 of the Standard Specifications to read:

"**440.04 HMA Surface Removal for Subsequent Resurfacing.** The existing HMA surface shall be removed to the depth specified on the plans with a self-propelled milling machine. The removal depth may be varied slightly at the discretion of the Engineer to satisfy the smoothness requirements of the finished pavement. The temperature at which the work is performed, the nature and condition of the equipment, and the manner of performing the work shall be such that the milled surface is not torn, gouged, shoved or otherwise damaged by the milling operation. Sufficient cutting passes shall be made so that all irregularities or high spots are eliminated to the satisfaction of the Engineer. When tested with a 16 ft (5 m) straightedge, the milled surface shall have no surface variations in excess of 3/16 in. (5 mm)."

General Equipment

Revise Article 1101.04 of the Standard Specifications to read:

"**1101.04 Pavement Surface Grinding Equipment.** The pavement surface grinding device shall have a minimum effective head width of 3 ft (0.9 m).

(a) Diamond Saw Blade Machine. The machine shall be self-propelled with multiple diamond saw blades.

(b) Profile Milling Machine. The profile milling machine shall be a drum device with carbide or diamond teeth with spacing of 0.315 in. (8 mm) or less and maintain proper forward speed for surface texture according to the manufacturer's specifications."

80435

VEHICLE AND EQUIPMENT WARNING LIGHTS (BDE)

Effective: November 1, 2021
Revised: November 1, 2022

Add the following paragraph after the first paragraph of Article 701.08 of the Standard Specifications:

"The Contractor shall equip all vehicles and equipment with high-intensity oscillating, rotating, or flashing, amber or amber-and-white, warning lights which are visible from all directions. In accordance with 625 ILCS 5/12-215, the lights may only be in operation while the vehicle or equipment is engaged in construction operations."

80439

WEEKLY DBE TRUCKING REPORTS (BDE)

Effective: June 2, 2012
Revised: November 1, 2021

The Contractor shall submit a weekly report of Disadvantaged Business Enterprise (DBE) trucks hired by the Contractor or subcontractors (i.e. not owned by the Contractor or subcontractors) that are used for DBE goal credit.

The report shall be submitted to the Engineer on Department form "SBE 723" within ten business days following the reporting period. The reporting period shall be Sunday through Saturday for each week reportable trucking activities occur.

Any costs associated with providing weekly DBE trucking reports shall be considered as included in the contract unit prices bid for the various items of work involved and no additional compensation will be allowed.

80302

WORK ZONE TRAFFIC CONTROL DEVICES (BDE)

Effective: March 2, 2020

Add the following to Article 701.03 of the Standard Specifications:

"(q) Temporary Sign Supports .....1106.02"

Revise the third paragraph of Article 701.14 of the Standard Specifications to read:

"For temporary sign supports, the Contractor shall provide a FHWA eligibility letter for each device used on the contract. The letter shall provide information for the set-up and use of the device as well as a detailed drawing of the device. The signs shall be supported within 20 degrees of vertical. Weights used to stabilize signs shall be attached to the sign support per the manufacturer's specifications."

Revise the first paragraph of Article 701.15 of the Standard Specifications to read:

"**701.15 Traffic Control Devices.** For devices that must meet crashworthiness standards, the Contractor shall provide a manufacturer's self-certification or a FHWA eligibility letter for each Category 1 device and a FHWA eligibility letter for each Category 2 and Category 3 device used on the contract. The self-certification or letter shall provide information for the set-up and use of the device as well as a detailed drawing of the device."

Revise the first six paragraphs of Article 1106.02 of the Standard Specifications to read:

"**1106.02 Devices.** Work zone traffic control devices and combinations of devices shall meet crashworthiness standards for their respective categories. The categories are as follows.

Category 1 includes small, lightweight, channelizing and delineating devices that have been in common use for many years and are known to be crashworthy by crash testing of similar devices or years of demonstrable safe performance. These include cones, tubular markers, plastic drums, and delineators, with no attachments (e.g. lights). Category 1 devices manufactured after December 31, 2019 shall be MASH-16 compliant. Category 1 devices manufactured on or before December 31, 2019, and compliant with NCHRP 350 or MASH 2009, may be used on contracts let before December 31, 2024.

Category 2 includes devices that are not expected to produce significant vehicular velocity change but may otherwise be hazardous. These include vertical panels with lights, barricades, temporary sign supports, and Category 1 devices with attachments (e.g. drums with lights). Category 2 devices manufactured after December 31, 2019 shall be MASH-16 compliant. Category 2 devices manufactured on or before December 31, 2019, and compliant with NCHRP 350 or MASH 2009, may be used on contracts let before December 31, 2024.

Category 3 includes devices that are expected to cause significant velocity changes or other potentially harmful reactions to impacting vehicles. These include crash cushions (impact

attenuators), truck mounted attenuators, and other devices not meeting the definitions of Category 1 or 2. Category 3 devices manufactured after December 31, 2019 shall be MASH-16 compliant. Category 3 devices manufactured on or before December 31, 2019, and compliant with NCHRP 350 or MASH 2009, may be used on contracts let before December 31, 2029. Category 3 devices shall be crash tested for Test Level 3 or the test level specified.

Category 4 includes portable or trailer-mounted devices such as arrow boards, changeable message signs, temporary traffic signals, and area lighting supports. It is preferable for Category 4 devices manufactured after December 31, 2019 to be MASH-16 compliant; however, there are currently no crash tested devices in this category, so it remains exempt from the NCHRP 350 or MASH compliance requirement.

For each type of device, when no more than one MASH-16 compliant is available, an NCHRP 350 or MASH-2009 compliant device may be used, even if manufactured after December 31, 2019."

Revise Articles 1106.02(g), 1106.02(k), and 1106.02(l) to read:

"(g) Truck Mounted/Trailer Mounted Attenuators. The attenuator shall be approved for use at Test Level 3. Test Level 2 may be used for normal posted speeds less than or equal to 45 mph.

(k) Temporary Water Filled Barrier. The water filled barrier shall be a lightweight plastic shell designed to accept water ballast and be on the Department's qualified product list.

Shop drawings shall be furnished by the manufacturer and shall indicate the deflection of the barrier as determined by acceptance testing; the configuration of the barrier in that test; and the vehicle weight, velocity, and angle of impact of the deflection test. The Engineer shall be provided one copy of the shop drawings.

(l) Movable Traffic Barrier. The movable traffic barrier shall be on the Department's qualified product list.

Shop drawings shall be furnished by the manufacturer and shall indicate the deflection of the barrier as determined by acceptance testing; the configuration of the barrier in that test; and the vehicle weight, velocity, and angle of impact of the deflection test. The Engineer shall be provided one copy of the shop drawings. The barrier shall be capable of being moved on and off the roadway on a daily basis."

80427

ILLINOIS DEPARTMENT OF TRANSPORTATION
(IDOT)
LOCAL ROADS SPECIAL PROVISIONS

State of Illinois
DEPARTMENT OF TRANSPORTATION
Bureau of Local Roads and Streets

SPECIAL PROVISION
FOR
BITUMINOUS MATERIALS COST ADJUSTMENT FOR LOCAL LETTINGS

(RETURN FORM WITH BID)

Effective: June 16, 2017
Revised:

Description. Bituminous material cost adjustments will be made to provide additional compensation to the Contractor, or credit to the project owner, for fluctuations in the cost of bituminous materials when optioned by the Contractor. The bidder shall indicate on the attached form whether or not this special provision will be part of the contract and submit the completed form with his/her bid. Failure to submit the form, or failure to fill out the form completely, shall make this contract exempt of bituminous materials cost adjustments.

The adjustments shall apply to permanent and temporary hot-mix asphalt (HMA) mixtures, bituminous surface treatments (cover and seal coats), and preventative maintenance type surface treatments that are part of the original proposed construction, or added as extra work and paid for by agreed unit prices. The adjustments shall not apply to bituminous prime coats, tack coats, crack filling/sealing, joint filling/sealing, or extra work paid for at a lump sum price or by force account.

Method of Adjustment. Bituminous materials cost adjustments will be computed as follows.

$CA = (BPI_P - BPI_L) \times (\%AC_V / 100) \times Q$

Where: CA = Cost Adjustment, $.

BPI_P = Bituminous Price Index, as published by the Department of Transportation for the month the work is performed, $/ton ($/metric ton).

BPI_L = Bituminous Price Index, as published by the Department of Transportation for the month prior to the letting for work paid for at the contract price; or for the month the agreed unit price letter is submitted by the Contractor for extra work paid for by agreed unit price, $/ton ($/metric ton).

$\%AC_V$ = Percent of virgin Asphalt Cement in the Quantity being adjusted. For HMA mixtures, the % AC_V will be determined from the adjusted job mix formula. For bituminous materials applied, a performance graded or cutback asphalt will be considered to be 100% AC_V and undiluted emulsified asphalt will be considered to be 65% AC_V.

Q = Authorized construction Quantity, tons (metric tons) (see below).

For HMA mixtures measured in square yards: Q, tons = A x D x (G_{mb} x 46.8) / 2000. For HMA mixtures measured in square meters: Q, metric tons = A x D x (G_{mb} x 1) / 1000. When computing adjustments for full-depth HMA pavement, separate calculations will be made for the binder and surface courses to account for their different G_{mb} and % $AC_{V.}$

For bituminous materials measured in gallons: Q, tons = V x 8.33 lb/gal x SG / 2000
For bituminous materials measured in liters: Q, metric tons = V x 1.0 kg/L x SG / 1000

Where: A = Area of the HMA mixture, sq yd (sq m).
D = Depth of the HMA mixture, in. (mm).
G_{mb} = Average bulk specific gravity of the mixture, from the approved mix design.
V = Volume of the bituminous material, gal (L).
SG = Specific Gravity of bituminous material as shown on the bill of lading.

Basis of Payment. Bituminous materials cost adjustments may be positive or negative but will only be made when there is a difference between the BPI_L and BPI_P in excess of five percent, as calculated by:

Percent Difference = $\{(BPI_L - BPI_P) \div BPI_L\} \times 100$

Bituminous materials cost adjustments will be calculated for each calendar month in which applicable bituminous material is placed; and will be paid or deducted when all other contract requirements for the work placed during the month are satisfied. The adjustments shall not apply during contract time subject to liquidated damages for completion of the entire contract.

Return With Bid

OPTION FOR
BITUMINOUS MATERIALS COST ADJUSTMENT

The bidder shall submit this completed form with his/her bid. Failure to submit the form, or failure to fill out the form completely, shall make this contract exempt of bituminous materials cost adjustments. After award, this form, when submitted, shall become part of the contract.

Contract No.: _____

Company Name: _____

Contractor's Option:

Is your company opting to include this special provision as part of the contract?

Yes ☐ No ☐

Signature: _____ **Date:** _____

State of Illinois
DEPARTMENT OF TRANSPORTATION
Bureau of Local Roads and Streets

SPECIAL PROVISION
FOR
STEEL COST ADJUSTMENT FOR LOCAL LETTINGS

(RETURN FORM WITH BID)

Effective: June 16, 2017
Revised:

Description. Steel cost adjustments will be made to provide additional compensation to the Contractor, or a credit to the project owner, for fluctuations in steel prices when optioned by the Contractor. The bidder shall indicate on the attached form whether or not this special provision will be part of the contract and submit the completed form with his/her bid. Failure to submit the form or failure to indicate contract number, company name, and sign and date the form shall make this contract exempt of steel cost adjustments for all items of steel. Failure to indicate "Yes" for any item of work will make that item of steel exempt from steel cost adjustment.

Types of Steel Products. An adjustment will be made for fluctuations in the cost of steel used in the manufacture of the following items:

Metal Piling (excluding temporary sheet piling)
Structural Steel
Reinforcing Steel

Other steel materials such as dowel bars, tie bars, mesh reinforcement, guardrail, steel traffic signal and light poles, towers and mast arms, metal railings (excluding wire fence), and frames and grates will be subject to a steel cost adjustment when the pay items they are used in have a contract value of $10,000 or greater.

The adjustments shall apply to the above items when they are part of the original proposed construction, or added as extra work and paid for by agreed unit prices. The adjustments shall not apply when the item is added as extra work and paid for at a lump sum price or by force account.

Documentation. Sufficient documentation shall be furnished to the Engineer to verify the following:

(a) The dates and quantity of steel, in lb (kg), shipped from the mill to the fabricator.

(b) The quantity of steel, in lb (kg), incorporated into the various items of work covered by this special provision. The project owner reserves the right to verify submitted quantities.

Method of Adjustment. Steel cost adjustments will be computed as follows:

SCA = Q X D

Where: SCA = steel cost adjustment, in dollars
Q = quantity of steel incorporated into the work, in lb (kg)
D = price factor, in dollars per lb (kg)

$D = MPI_M - MPI_L$

Where: MPI_M = The Materials Cost Index for steel as published by the Engineering News-Record for the month the steel is shipped from the mill. The indices will be converted from dollars per 100 lb to dollars per lb (kg).

MPI_L = The Materials Cost Index for steel as published by the Engineering News-Record for the month prior to the letting for work paid for at the contract price; or for the month the agreed unit price letter is submitted by the Contractor for extra work paid for by agreed unit price. The indices will be converted from dollars per 100 lb to dollars per lb (kg).

The unit weights (masses) of steel that will be used to calculate the steel cost adjustment for the various items are shown in the attached table.

No steel cost adjustment will be made for any products manufactured from steel having a mill shipping date prior to the letting date.

If the Contractor fails to provide the required documentation, the method of adjustment will be calculated as described above; however, the MPI_M will be based on the date the steel arrives at the job site. In this case, an adjustment will only be made when there is a decrease in steel costs.

Basis of Payment. Steel cost adjustments may be positive or negative but will only be made when there is a difference between the MPI_L and MPI_M in excess of five percent, as calculated by:

Percent Difference = $\{(MPI_L - MPI_M) \div MPI_L\} \times 100$

Steel cost adjustments will be calculated by the Engineer and will be paid or deducted when all other contract requirements for the items of work are satisfied. Adjustments will only be made for fluctuations in the cost of the steel as described herein. No adjustment will be made for changes in the cost of manufacturing, fabrication, shipping, storage, etc.

The adjustments shall not apply during contract time subject to liquidated damages for completion of the entire contract.

Attachment

Item	Unit Mass (Weight)
Metal Piling (excluding temporary sheet piling)	
Furnishing Metal Pile Shells 12 in. (305 mm), 0.179 in. (3.80 mm) wall thickness)	23 lb/ft (34 kg/m)
Furnishing Metal Pile Shells 12 in. (305 mm), 0.250 in. (6.35 mm) wall thickness)	32 lb/ft (48 kg/m)
Furnishing Metal Pile Shells 14 in. (356 mm), 0.250 in. (6.35 mm) wall thickness)	37 lb/ft (55 kg/m)
Other piling	See plans
Structural Steel	See plans for weights (masses)
Reinforcing Steel	See plans for weights (masses)
Dowel Bars and Tie Bars	6 lb (3 kg) each
Mesh Reinforcement	63 lb/100 sq ft (310 kg/sq m)
Guardrail	
Steel Plate Beam Guardrail, Type A w/steel posts	20 lb/ft (30 kg/m)
Steel Plate Beam Guardrail, Type B w/steel posts	30 lb/ft (45 kg/m)
Steel Plate Beam Guardrail, Types A and B w/wood posts	8 lb/ft (12 kg/m)
Steel Plate Beam Guardrail, Type 2	305 lb (140 kg) each
Steel Plate Beam Guardrail, Type 6	1260 lb (570 kg) each
Traffic Barrier Terminal, Type 1 Special (Tangent)	730 lb (330 kg) each
Traffic Barrier Terminal, Type 1 Special (Flared)	410 lb (185 kg) each
Steel Traffic Signal and Light Poles, Towers and Mast Arms	
Traffic Signal Post	11 lb/ft (16 kg/m)
Light Pole, Tenon Mount and Twin Mount, 30 - 40 ft (9 – 12 m)	14 lb/ft (21 kg/m)
Light Pole, Tenon Mount and Twin Mount, 45 - 55 ft (13.5 – 16.5 m)	21 lb/ft (31 kg/m)
Light Pole w/Mast Arm, 30 - 50 ft (9 – 15.2 m)	13 lb/ft (19 kg/m)
Light Pole w/Mast Arm, 55 - 60 ft (16.5 – 18 m)	19 lb/ft (28 kg/m)
Light Tower w/Luminaire Mount, 80 - 110 ft (24 – 33.5 m)	31 lb/ft (46 kg/m)
Light Tower w/Luminaire Mount, 120 - 140 ft (36.5 – 42.5 m)	65 lb/ft (97 kg/m)
Light Tower w/Luminaire Mount, 150 - 160 ft (45.5 – 48.5 m)	80 lb/ft (119 kg/m)
Metal Railings (excluding wire fence)	
Steel Railing, Type SM	64 lb/ft (95 kg/m)
Steel Railing, Type S-1	39 lb/ft (58 kg/m)
Steel Railing, Type T-1	53 lb/ft (79 kg/m)
Steel Bridge Rail	52 lb/ft (77 kg/m)
Frames and Grates	
Frame	250 lb (115 kg)
Lids and Grates	150 lb (70 kg)

Return With Bid

OPTION FOR
STEEL COST ADJUSTMENT

The bidder shall submit this completed form with his/her bid. Failure to submit the form or properly complete contract number, company name, and sign and date the form shall make this contract exempt of steel cost adjustments for all items of steel. Failure to indicate "Yes" for any item of work will make that item of steel exempt from steel cost adjustment. After award, this form, when submitted shall become part of the contract.

Contract No.: _____

Company Name: _____

Contractor's Option:

Is your company opting to include this special provision as part of the contract plans for the following items of work?

Metal Piling	Yes	☐
Structural Steel	Yes	☐
Reinforcing Steel	Yes	☐
Dowel Bars, Tie Bars and Mesh Reinforcement	Yes	☐
Guardrail	Yes	☐
Steel Traffic Signal and Light Poles, Towers and Mast Arms	Yes	☐
Metal Railings (excluding wire fence)	Yes	☐
Frames and Grates	Yes	☐

Signature: _____ **Date:** _____

State of Illinois
DEPARTMENT OF TRANSPORTATION
Bureau of Local Roads & Streets
SPECIAL PROVISION
FOR
LOCAL QUALITY ASSURANCE/ QUALITY MANAGEMENT QC/QA
Effective: January 1, 2022

Replace the first five paragraphs of Article 1030.06 of the Standard Specifications with the following:

"**1030.06 Quality Management Program.** The Quality Management Program (QMP) will be Quality Control / Quality Assurance (QC/QA) according to the following."

Delete Article 1030.06(d)(1) of the Standard Specifications.

Revise Article 1030.09(g)(3) of the Standard Specifications to read:

"(3) If core testing is the density verification method, the Contractor shall provide personnel and equipment to collect density verification cores for the Engineer. Core locations will be determined by the Engineer following the document "Hot-Mix Asphalt QC/QA Procedure for Determining Random Density Locations" at density verification intervals defined in Article 1030.09(b). After the Engineer identifies a density verification location and prior to opening to traffic, the Contractor shall cut a 4 in. (100 mm) diameter core. With the approval of the Engineer, the cores may be cut at a later time."

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

"(2) After final rolling and prior to paving subsequent lifts, the Engineer will identify the random density verification test locations. Cores or nuclear density gauge testing will be used for density verification. The method used for density verification will be as selected below.

Density Verification Method	
☐	Cores
☐	Nuclear Density Gauge (Correlated when paving ≥ 3,000 tons per mixture)

Density verification test locations will be determined according to the document "Hot-Mix Asphalt QC/QA Procedure for Determining Random Density Locations". The density testing interval for paving wider than or equal to 3 ft (1 m) will be 0.5 miles (800 m) for lift thicknesses of 3 in. (75 mm) or less and 0.2 miles (320 m) for lift thicknesses greater than 3 in. (75 mm). The density testing interval for paving less than 3 ft (1 m) wide will be 1 mile (1,600 m). If a day's paving will be less than the prescribed density testing interval, the length of the day's paving will be the interval for that day. The density testing interval for mixtures used for patching will be 50 patches with a minimum of one test per mixture per project.

If core testing is the density verification method, the Engineer will witness the Contractor coring, and secure and take possession of all density samples at the

density verification locations. The Engineer will test the cores collected by the Contractor for density according to Illinois Modified AASHTO T 166 or AASHTO T 275.

If nuclear density gauge testing is the density verification method, the Engineer will conduct nuclear density gauge tests. The Engineer will follow the density testing procedure detailed in the document "Illinois Modified ASTM D 2950, Standard Test Method for Density of Bituminous Concrete In-Place by Nuclear Method".

A density verification test will be the result of a single core or the average of the nuclear density tests at one location. The results of each density test must be within acceptable limits. The Engineer will promptly notify the Contractor of observed deficiencies."

Revise the seventh paragraph and all subsequent paragraphs in Section D. of the document "Hot-Mix Asphalt QC/QA Initial Daily Plant and Random Samples" to read:

"Mixtures shall be sampled from the truck at the plant by the Contractor following the same procedure used to collect QC mixture samples (Section A). This process will be witnessed by the Engineer who will take custody of the verification sample. Each sample bag with a verification mixture sample will be secured by the Engineer using a locking ID tag. Sample boxes containing the verification mixture sample will be sealed/taped by the Engineer using a security ID label."

ILLINOIS DEPARTMENT OF TRANSPORTATION
(IDOT)
DISTRICT 1 SPECIAL PROVISIONS (AUGUST 4, 2023 REVISED AUGUST 18, 2023)

SPECIAL PROVISIONS CHECK LIST
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Designer: Civiltech Engineering **FAP:** _____
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√	Dir	File Name	Spec Title	Spec Dates
X	DES\	104. Maintenance of Roadways.docx	Maintenance of Roadways (D1)	E 9/30/85 R 11/1/96
	DES\	104. Status Of Utilities.docx	Status of Utilities (D1)	E 06/01/16 R 01/01/20
	DES\	105. Construction Layout Special for resurfacing with ADA and stand alone ADA.docx	Construction Layout Special for Resurfacing with ADA and Stand Alone ADA (D1)	E 01/01/17 R 04/17/17
X	DES\	107. Public Convenience and Safety.docx	Public Convenience and Safety (D1)	E 05/01/12 R 07/15/12
	DES\	107. Tollway Permit and Bond.docx	Tollway Permit and Bond (D1)	E 01/13/89
	DES\	108. Completion Date Plus Working Days.docx	Completion Date Plus Working Days (D1)	E 09/30/85 R 01/01/07
	DES\	108. Failure to Complete Work on Time.docx	Failure to Complete the Work on Time (D1)	E 09/30/85 R 01/01/07
	DES\	108. Incentive Payment Plan.docx	Incentive Payment Plan (D1)	E 10/01/95 R 01/01/07
	DES\	202. Lightweight Cellular Concrete Fill.docx	Lightweight Cellular Concrete Fill (D-1)	E 11/11/01 R 06/18/18
	DES\	205. Embankment I.docx	Embankment I (D1)	E 03/01/11 R 11/01/13
	DES\	205. Embankment II.docx	Embankment II (D1)	E 03/01/11 R 11/01/13
	DES\	208. Coarse Aggregate for Backfill, Trench Backfill and Bedding (D-1).docx	Coarse Aggregate for Backfill, Trench Backfill and Bedding (D1)	E 11/01/11 R 11/01/13
	DES\	208. RAP for Non-Porous Embankment and Backfill.docx	RAP For Non-Porous Embankment and Backfill (D1)	E 04/01/01 R 01/01/07
	DES\	400. Temporary Pavement.docx	Temporary Pavement (D1)	E 03/01/03 R 04/10/08
	DES\	402. Aggregate Surface Course for Temporary Access.docx	Aggregate Surface Course for Temporary Access (D1)	E 04/01/01 R 01/02/07
X	DES\	406. HMA Binder and Surface Course.docx	HMA Binder and Surface Course (D1)	E 11/01/19 R 12/01/21
	DES\	406. Pavement Rehabilitation by Hot In-Place Recycling.docx	Pavement Rehabilitation by Hot In-Place Recycling (D1)	E 07/11/03 R 05/05/14
	DES\	406. Winterized Temporary Access.docx	Winterized Temporary Access (D1)	E 01/01/12 R 03/05/12
	DES\	424. Detectable Warnings (Special) in City of Chicago.docx	Detectable Warnings (Special) in City of Chicago (D1)	E 07/20/17
	DES\	440. Pavement Removal, Special.docx	Pavement Removal, Special (D1)	E 01/13/89 R 01/01/07
	DES\	442. Class D Patches (Special).docx	CLASS D PATCHES (SPECIAL)	E 07/24/20 R
	DES\	481. Grading and Shaping Shoulders.docx	Grading and Shaping Shoulders (D1)	E 12/28/01 R 01/01/07
	DES\	502. Cofferdam (Type 1) (In-Stream Wetland Work).docx	Cofferdam (Type 1) (In-Stream/Wetland Work) (D1)	E 01/01/19 R 08/15/22
	DES\	502. Rock Excavation for Structures, Special.docx	Rock Excavation for Structures, Special (D1)	E 09/30/85 R 01/01/07
	DES\	503. Concrete Noise Abatement Walls (Absorptive & Reflective).docx	Concrete Noise Abatement Walls (Absorptive & Reflective) (D1)	E 09/05/08 R 12/18/18
	DES\	522. Rustication Finish For Retaining Walls.docx	Rustication Finish For Retaining Walls (D1)	E 05/01/90 R 01/01/07
	DES\	550. Storm Sewer Adjacent to or Crossing Water Main.docx	Storm Sewer Adjacent to or Crossing Water Main (D1)	E 02/01/96 R 01/01/07
	DES\	550. Storm Sewers & Sewer Connections to City of Chicago Sewers.docx	Storm Sewers & Sewer Connections to City of Chicago Sewers	E 09/30/85 R 03/10/21
	DES\	600. Slotted Drain.docx	Slotted Drain (D1)	E 09/30/85 R 01/01/07
X	DES\	602. Cleaning Existing Drainage Structures.docx	Cleaning Existing Drainage Structures (D1)	E 09/30/85 R 05/01/22
X	DES\	603. Adjustments-Reconstructs.docx	Adjustments and Reconstructions (D1)	E 03/15/11
X	DES\	603. Drainage and Inlet Protection Under Traffic.docx	Drainage and Inlet Protection Under Traffic (D1)	E 04/01/11 R 04/02/11
	DES\	606. Concrete Curb, Type B (Modified).docx	Concrete Curb, Type B (Modified) (D1)	E 09/30/85 R 01/01/07
	DES\	606. Curb or Combination Curb and Gutter Removal and Replacement.docx	Curb or Combination Curb and Gutter Removal and Replacement (D1)	E 01/01/20 R 09/01/22
	DES\	606. Stabilized Median Surface.docx	Stabilized Median Surface (D1)	E 09/30/85 R 03/02/17

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	DES\	637. Aggregate For Concrete Barrier (D-1).docx	Aggregate for Concrete Barrier (D1)	E 03/11/04 R 01/24/08
	DES\	670. Engineers Field Office Type A (D1).docx	Engineer's Field Office Type A (D1)	E 01/01/22
	DES\	670. Engineers Field Office Type A (Special) (D1).docx	Engineer's Field Office Type A (Special) (D1)	E 12/01/11 R 05/01/13
	DES\	701. Traffic Control & Protection (Arterials).docx	Traffic Control & Protection (Arterials) (D1)	E 02/01/96 R 03/01/11
X	DES\	701. Traffic Control Plan.docx	Traffic Control Plan (D1)	E 09/30/85 R 01/01/07
X	DES\	1004. Friction Aggregate.docx	Friction Aggregate (D1)	E 01/01/11 R 12/01/21
	DES\	1005. Rockfill (D-1).docx	Rockfill	E 01/01/10 R 04/01/22
	DES\	1020. Slipform Paving.docx	Slipform Paving (D1)	E 11/01/14
X	DES\	1030. HMA - Mixture Design Verification & Production.docx	HMA - Mixture Verification & Production (Modified for I-FIT) (D1)	E 01/01/19 R 12/01/21
		Bureau of Electrical Special Provisions		
	ELE\	810.02-UNDERGROUND RACEWAYS.docx	Underground Raceways	E 03/01/15
	ELE\	Breakaway Device_2023.docx	Breakaway Device	E 01/01/23
	ELE\	Combination_Controller_2018.docx	Combination Lighting Controller	E 02/01/15 R 05/05/22
	ELE\	Elec_Serv_Disc_lgt_sig_2012.docx	Electric Service Disconnect, Lighting And Traffic Signal	E: 01/01/12
	ELE\	Fiber Optic Cable_SM_2013_v2.docx	Fiber Optic Cable	E 03/15/13
	ELE\	Fiber Optic Cable_SM_Micro_2018_v1.docx	Fiber Optic Cable	E 02/01/18
	ELE\	Fiber Optic Cable_Splice_2014_v1.docx	Fiber Optic Cable	E 06/01/14
	ELE\	General_Electrical_Provisions_2021.docx	General Electrical Requirements GPS	E 06/01/21
	ELE\	HighMast_Luminaire_LED_2021.docx	Luminaire, LED, Highmast	E 07/01/21
	ELE\	HPS_Underpass_2012.docx	Underpass Luminaire, Hps, Stainless Steel Housing	E 01/01/12
	ELE\	Innerduct_v4_2014.docx	Wire and Cable	E 10/01/14
	ELE\	Junction_Box_Embedded_2012.docx	Junction Box Embedded in Structure	E 01/01/12
	ELE\	Light_Tower__2016_Galvanized_AASHTO_exception_v2.docx	Light Tower	E 04/01/16
	ELE\	Lighting_Controller_SCADA_2012.docx	Lighting Controller, Radio Control, Duplex, Console Type	E 01/01/12
	ELE\	Lighting_Maint_2017.docx	Maintenance of Lighting Systems	E 03/01/17
	ELE\	Luminaire_safety_cable_2012.docx	Luminaire Safety Cable Assembly	E 01/01/12
	ELE\	Microduct_2018_v2.docx	Underground Conduit, Multi-Duct, 16mm Microducts	E 10/01/18
	ELE\	Protect_Underpass_LightingSystem_2012.docx	Protect & Maintain Underpass Luminaires	E 07/01/12
	ELE\	Raceway_Exposed_2012.docx	Exposed Raceways	E 01/01/12
	ELE\	Roadway_Luminaire_LED_2023.docx	Roadway Luminaire, LED	E 01/01/23
	ELE\	Service_Connection_2012.docx	Electric Utility Service Connection (ComEd)	E 01/01/12
	ELE\	Service_Install_2012.docx	Electric Service Installation	E 01/01/12
	ELE\	Temp_light_SingleLaneStg_2022.docx	Temporary Lighting For Single Lane Staging	E 01/01/22
	ELE\	Temp_pole_install_2012.docx	Temporary Wood Pole, Install Only	E 01/01/12
	ELE\	Underpass_Luminaire_LED_2021.docx	Underpass Luminaire, LED	E 07/01/21
	ELE\	Unit_Duct_2012.docx	Unit Duct	E 01/01/12
	ELE\	Wire_Cable_2012.docx	Wire and Cable	E 01/01/12

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		Guide Bridge Special Provisions		
	GBS\	gbsp13.doc	High Load Multi-Rotational Bearings	E 10/13/88 R 09/02/22
	GBS\	gbsp14.doc	Jack and Remove Existing Bearings	E 4/20/94 R 4/13/18
	GBS\	gbsp15.doc	Three Sided Precast Concrete Structure	E 7/12/94 R 12/21/16
	GBS\	gbsp16.doc	Jacking Existing Superstructure	E 1/11/93 R 4/13/18
	GBS\	gbsp18.doc	Modular Expansion Joint	E 5/19/94 R 12/9/22
	GBS\	gbsp21.doc	Cleaning and Painting Contact Surfaces of Existing Steel Structures	E 6/30/03 R 10/23/20
	GBS\	GBSP25.doc	Cleaning and Painting Existing Steel Structures	E 10/02/01 R 10/23/20
	GBS\	GBSP26.doc	Containment and Disposal of Lead Paint Cleaning Residues	E 10/02/01 R 04/22/16
	GBS\	gbsp28.doc	Deck Slab Repair	E 5/15/95 R 4/13/18
	GBS\	gbsp29.doc	Bridge Deck Microsilica Concrete Overlay	E 5/15/95 R 04/30/21
	GBS\	gbsp30.doc	Bridge Deck Latex Concrete Overlay	E 5/15/95 R 04/30/21
	GBS\	gbsp31.doc	Bridge Deck HRM Concrete Overlay	E 1/21/00 R 04/30/21
	GBS\	gbsp33.doc	Pedestrian Truss Superstructure	E 1/13/98 R 12/9/22
	GBS\	GBSP34.doc	Concrete Wearing Surface	E 6/23/94 R 10/04/16
	GBS\	gbsp4.doc	Polymer Modified Portland Cement Mortar	E 6/7/94 R 04/01/16
	GBS\	GBSP45.doc	Bridge Deck Thin Polymer Overlay	E 05/07/97 R 02/06/13
	GBS\	GBSP53.doc	Structural Repair of Concrete	E 03/15/06 R 8/9/19
	GBS\	GBSP55.doc	Erection of Curved Steel Structures	E 06/01/07 R
	GBS\	GBSP59.docx	Diamond Grinding and Surface Testing	E 12/06/04 R 04/15/22
	GBS\	GBSP60.doc	Containment and Disposal of Non Lead Paint Cleaning Residues	E 11/25/04 R 04/15/22
	GBS\	GBSP61.doc	Slipform Parapet	E 06/01/07 R 03/01/19
	GBS\	GBSP67.doc	Structural Assessment Reports for Contractor's Means and Methods	E 03/06/09 R 10/05/15
	GBS\	GBSP71.doc	Aggregate Column Ground Improvement	E 01/15/09 R 10/15/11
	GBS\	GBSP72.doc	Bridge Deck Fly Ash or Ground Granulated Blast-Furnace Concrete Overlay	E 1/18/11 R 04/30/21
	GBS\	GBSP78.doc	Bridge Deck Construction	E 10/22/13 R 12/21/16
	GBS\	GBSP79.doc	Bridge Deck Grooving (Longitudinal)	E 12/29/14 R 3/29/17
	GBS\	GBSP81.docx	Membrane Waterproofing for buried Structures	E 10/04/16 R 3/1/19
	GBS\	GBSP82.docx	Metallizing of Structural Steel	E 10/4/16 R 10/20/17
	GBS\	GBSP83.docx	Hot Dip Galvanizing for Structural Steel	E 6/22/99 R 10/20/17
	GBS\	GBSP85.docx	Micropiles	E 04/19/96 R 10/23/20
	GBS\	GBSP86.doc	Drilled Shafts	E 10/05/15 R 10/04/16
	GBS\	GBSP87.doc	Lightweight Cellular Concrete Fill	E 11/11/01 R 04/01/16
	GBS\	GBSP88.doc	Corrugated Structural Plate Structures	E 4/22/16 R 4/13/18
	GBS\	GBSP89.docx	Preformed Pavement Joint Seal	E 10/4/16 R 10/23/20
	GBS\	GBSP90.doc	Three Sided Precast Concrete Structure	E 12/21/16 R 4/13/18
	GBS\	GBSP91.docx	Crosshole Sonic Logging Testing of Drilled Shafts	E 04/20/16 R 8/9/19
	GBS\	GBSP92.docx	Thermal Integrity testing of Drilled Shafts	E 04/20/16 R
	GBS\	GBSP93.docx	Preformed Bridge Joint Seal	E 12/21/16 R 10/23/20
	GBS\	GBSP94.doc	Warranty for Cleaning and Painting Steel Structures	E 3/3/00 R 11/24/04
	GBS\	GBSP96.doc	Erection of Bridge Girders	E 8/9/19 R

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	GBS\	GBSP97.docx	Folded/Formed PVC Pipeliner	E 4/15/22 R
	GBS\	GBSP98.docx	Cured-in-Place Pipe Liner	E 4/15/22 R
	GBS\	GBSP99.docx	Spray-Applied Pipe Liner	E 4/15/22 R
	GBS\	GBSP100.doc	Bar Splicers	E 9/2/22 R 12/9/22
	GBS\	GBSP101.docx	Noise Abatement Wall, Ground Mounted	E 12/9/22 R
	GBS\	GBSP102.docm	Noise Abatement Wall, Structure Mounted	E 12/9/22 R
	GBS\	GBSP103.docm	Noise Abatement Wall Anchor Rod Assembly	E 12/9/22 R
	GBS\	index.doc	GBSP Check Sheet	
		Bridge and Roadway Maintenance Special Provisions		
	MNT1\	ADJRCK.doc	Adjust Rocker and Sole Plate	E 01/23/95 R 01/01/07
	MNT1\	APPR_SLAB_REM&REPL.doc	Approach Slab Removal & Replacement	E 12/28/01 R 08/01/15
	MNT1\	APSLRP.DOC	Approach Slab Repair	E 3/13/97 R 04/12/18
	MNT1\	Bmstrt.doc	Beam Straightening	E 12/06/94 R 01/01/07
	MNT1\	Brgpad.doc	Bearing Pad Adjustment	E 07/27/94 R 01/01/07
	MNT1\	Bridge_Drain_Sys_Repair.doc	Bridge Drainage System Repairs	E 11/16/10 R 09/15/11
	MNT1\	BRR.doc	Bridge Rail Removal	E 04/15/99 R 01/01/07
	MNT1\	Cleaning Drainage System.doc	Cleaning Drainage System	E 06/21/04 R 08/30/10
	MNT1\	Concscar.doc	Concrete Bridge Deck Scarification [W/New Hma Overlay W/O Wms]	E 11/22/02 R 01/01/07
	MNT1\	CWS.DOC	Concrete Wearing Surface [Use on Slab Bridges - for PPC Dk Bms use GBSP34]	E 06/23/94 R 01/01/07
	MNT1\	Debris_Removal.doc	Debris Removal	E 06/27/02
	MNT1\	dowelrp.doc	Dowel Repair	E 07/27/94 R 01/01/07
	MNT1\	EPXINJ.DOC	Epoxy Injection	E 12/06/94 R 01/01/07
	MNT1\	Fldrex.doc	Floor Drain Extension	E 02/01/96 R 04/07/98
	MNT1\	Grade_Shape_Foreslope.doc	Grading And Shaping Foreslopes	E 04/01/08
	MNT1\	Groutrp.doc	Grout Repair	E 07/27/94 R 01/01/07
	MNT1\	HMArm1.doc	Hot-Mix Asphalt Surface Removal Complete	E 12/08/93 R 01/01/07
	MNT1\	HMArm2.DOC	Hot-Mix Asphalt Surface Removal [Use w/ PPC Deck Beams]	E 07/27/94 R 01/01/07
	MNT1\	HMArm3.doc	Hot-Mix Asphalt Surface Removal (Deck)	E 04/29/96 R 01/01/07
	MNT1\	HMArm4.doc	Hot-Mix Asphalt Surface Removal [Use w/Deck Slab Repairs]	E 07/27/94 R 01/01/07
	MNT1\	Jckcrb.doc	Jacking and Cribbing	E 10/05/99 R 01/01/07
	MNT1\	JKRPBR.DOC	Jack and Reposition Bearings	E 12/15/93 R 07/15/96
	MNT1\	Keep_Toll_Open_To_Traffic.doc	Keeping the Tollway Open to Traffic	E 03/22/96 R 10/12/10
	MNT1\	Keywyrp.doc	Keyway Repair	E 07/27/94 R 08/12/11
	MNT1\	NIGHT_WZ_LIGHT(D1).doc	Nighttime Work Zone Lighting (D1)	E 11/01/08 R 06/15/10
	MNT1\	PINLNK.DOC	Pin and Link Replacement	E 11/20/95 R 06/20/96
	MNT1\	PINRR.DOC	Pin Replacement	E 06/11/96 R 06/20/96
	MNT1\	plexdd.doc	Plug Existing Deck Drains	E 11/06/96 R 01/01/07
	MNT1\	PPROSH.DOC	Permanent Protective Shield System	E 10/03/96 R 06/27/08
	MNT1\	PrGrAng.doc	Pressure Grouting Angles	E 06/01/93 R 01/01/07
	MNT1\	reancr.doc	Re-Anchor Existing Expansion Joint Angles	E 02/20/98
	MNT1\	REBAR.DOC	Cleaning and Painting Exposed Rebar	E 03/20/97 R 01/01/07
	MNT1\	RECIBm.doc	Removal of Existing Concrete I-Beam	E 07/09/98 R 05/05/99
	MNT1\	REXPPCDB.doc	Removal of Existing Precast Prestressed Concrete Deck Beams	E 10/28/98 R 01/01/07
	MNT1\	RREXRL.DOC	Removing and Re-Erecting Existing Railing	E 10/31/96 R 01/01/07

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	MNT1\	Scarify.doc	Concrete Bridge Deck Scarification	E 05/15/95 R 01/01/07
	MNT1\	SteelRem.doc	Structural Steel Removal	E 10/03/97 R 01/01/07
	MNT1\	steelrep.doc	Structural Steel Repair	E 12/15/00 R 01/01/07
	MNT1\	STRBM.DOC	Straighten Bent Members	E 01/23/97 R 06/19/06
	MNT1\	StructRepConcr(SP).doc	Structural Repair Of Concrete (Special)	E 04/02/07
	MNT1\	Tmpsh1.doc	Temporary Shoring & Cribbing [when req'd for damaged beam replacement; requires SE]	E 06/16/92 R 03/11/03
	MNT1\	Tmpsh1a.doc	Temporary Shoring & Cribbing [when "May be req'd" for or Day Labor beam replacement; No SE req'd]	E 06/16/92 R 04/22/03
	MNT1\	Tmpsh2.doc	Temporary Shoring and Cribbing [for use w/longitudinal joint. closure on slab bridges]	E 07/27/94 R 03/11/03
	MNT1\	TMPSH3.DOC	Temporary Shoring and Cribbing [Use during Pile Repair]	E 07/16/92 R 03/11/03
	MNT1\	TMPSH4.DOC	Temporary Shoring and Cribbing [Use to support Beams over substructure repair]	E 7/16/92 R 10/17/11
	MNT1\	TMPSH5.DOC	Temporary Shoring and Cribbing [Support Slab Bridge during Joint reconstruction]	E 07/16/92 R 03/11/03
	MNT1\	TMPSH6.DOC	Temporary Shoring and Cribbing [support effected beam during beam end repairs]	E 10/22/04 R 11/09/04
	MNT1\	TMPSLB.DOC	Temporary Slab Support System [use with beam replacement]	E 07/27/94 R 03/11/03
	MNT1\	TMPSP1.DOC	Temporary Support System [Use for Pin & Link Replacement]	E 11/20/95 R 04/04/97
	MNT1\	TMPSP2.DOC	Temporary Support System [Use if Pins over RR]	E 11/20/95 R 03/11/03
	MNT1\	Work_Zone_Traff_Ctrl(D1-M).doc	Work Zone Traffic Control (D-1 Maintenance)	E 05/30/96 R 06/15/10
	MNT2\	COARSE SAND PLACEMENT.doc	Coarse Sand Placement	E 02/07/07
	MNT2\	GENERAL REQUIREMENTS FOR WEED CONTROL SPRAYING.doc	General Requirements For Weed Control Spraying	E 02/07/07
	MNT2\	MULCH PLACEMENT FOR WOODY PLANTS.doc	Mulch Placement For Woody Plants	E 02/07/07
	MNT2\	Pruning-safety.doc	Pruning For Safety And Equipment Clearance	E 10/31/06
	MNT2\	SELECTIVE CLEARING.docx	Selective Clearing	E 02/08/07 R 09/01/22
	MNT2\	WEED CONTROL PRE-EMERGENT GRANULAR HERBICIDE.doc	Weed Control, Pre-Emergent Granular Herbicide	E 07/29/02 R 02/07/07
	MNT2\	WEED CONTROL, NON-SELECTIVE AND NON-RESIDUAL.doc	Weed Control, Non-Selective And Non-Residual	E 02/07/07
	MNT2\	WEED CONTROL, TEASEL (POUND).doc	Weed Control, Teasel (Pound)	E 02/07/07
Bureau of Traffic Special Provisions				
	TRF\	701.01T-KEEPING THE EXPRESSWAY OPEN TO TRAFFIC.doc	Keeping The Expressway Open To Traffic	E 03/22/96 R 10/9/20
	TRF\	701.02T-FAILURE TO OPEN TRAFFIC LANES TO TRAFFIC.docx	Failure To Open Traffic Lanes To Traffic	E 03/22/96 R 02/09/05
	TRF\	701.03T-TRAFFIC CONTROL AND PROTECTION (EXPRESSWAYS).doc	Traffic Control And Protection (Expressways)	E 03/08/96 R 04/01/19
	TRF\	701.04T-TRAFFIC CONTROL SURVIELLANCE (EXPRESSWAYS).doc	Traffic Control Surveillance (Expressways)	E 10/25/95 R 01/21/15
	TRF\	701.06T-TEMPORARY INFORMATION SIGNING.docx	Temporary Information Signing	E 11/13/96 R 01/29/20

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	TRF\	701.07T-TRAFFIC CONTROL FOR WORK ZONE AREAS.docx	Traffic Control For Work Zone Areas	E 09/14/95 R 01/01/07
	TRF\	701.08Ta-KEEPING ARTERIAL ROADWAYS OPEN TO TRAFFIC (LANE CLOSURES ONLY).docx	Keeping Arterial Roadways Open to Traffic (Lane Closures Only)	E 01/22/03 R 08/10/17
	TRF\	701.08Tb-KEEPING ARTERIAL ROADWAYS OPEN TO TRAFFIC (WITH 15 MIN FULL STOPS).docx	Keeping Arterial Roadways Open to Traffic (With 15 MIN Full Stops)	E 01/22/03 R 08/10/17
	TRF\	701.15T-SPEED DISPLAY TRAILER (D1).docx	Speed Display Trailer (D1)	E 4/01/15; R 4/1/21
	TRF\	701.16T-SMART TRAFFIC MONITORING SYSTEM.docx	Smart Traffic Monitoring System	E 09/01/21
	TRF\	701.17T-RAISED REFLECTIVE PAVEMENT MARKER REFLECTOR REMOVAL.docx	Raised Reflective Pavement Marker, Reflector Removal	E 08/01/23
	TRF\	701.18T-RAISED REFLECTIVE PAVEMENT MARKER REFLECTOR REPLACEMENT.docx	Raised Reflective Pavement Marker, Reflector Replacement	E 08/01/23
	TRF\	720.01TS-MAST ARM SIGN PANELS.docx	Mast Arm Sign Panels	E 05/22/02 R 07/01/15
	TRF\	720.02TS-SIGN SHOP DRAWING SUBMITTAL.docx	Sign Shop Drawing Submittal	E 01/22/13 R 07/01/15
	TRF\	733.09T-OVERHEAD SIGN STRUCTURE BRIDGE MOUNTED.docx	Overhead Sign Structure - Bridge Mounted	E 07/01/15 R 3/1/2017
	TRF\	780.01T-45 MIL HOT SPRAY THERMOPLASTIC PAVEMENT MARKING.docx	45 Mil Hot Spray Thermoplastic Pavement Marking	E 02/28/94 R 12/18/12
	TRF\	800.01TS-TRAFFIC SIGNAL GENERAL REQUIREMENTS.docx	Traffic Signal General Requirements	E 05/22/02 R 03/25/16
	TRF\	800.02TS-OPTIMIZE TRAFFIC SIGNAL SYSTEM.docx	Optimize Traffic Signal System	E 05/22/02 R 11/01/23
	TRF\	800.03TS-RE-OPTIMIZE TRAFFIC SIGNAL SYSTEM.docx	Re-Optimize Traffic Signal System	E 05/22/02 R 11/01/23
	TRF\	805.01TS-SERVICE INSTALLATION (TRAFFIC SIGNALS).docx	Service Installation (Traffic Signals)	E 05/22/02 R 06/15/16
	TRF\	805.02TS-ELECTRIC METER.docx	Electric Meter	E 11/01/23
	TRF\	806.01TS-GROUNDING OF TRAFFIC SIGNAL SYSTEMS.docx	Grounding Of Traffic Signal Systems	E 05/22/02 R 07/01/15
	TRF\	810.01TS-COILABLE NON-METALLIC CONDUIT.docx	Coilable Non-Metallic Conduit	E 05/22/02 R 07/01/15
	TRF\	810.02TS-UNDERGROUND RACEWAYS.docx	Underground Raceways	E 05/22/02 R 11/01/23
	TRF\	810.03TS-ROD AND CLEAN EXISTING CONDUIT.docx	Rod And Clean Existing Conduit	E 01/01/15 R 07/01/15
	TRF\	814.01TS-HANDHOLES.docx	Handholes	E 01/01/02 R 11/01/23
	TRF\	817.02TS-FIBER OPTIC TRACER CABLE.docx	Fiber Optic Tracer Cable	E 05/22/02 R 11/01/23
	TRF\	850.01TS-MAINTENANCE OF EXISTING TRAFFIC SIGNAL AND FLASHING BEACON INSTALLATION.docx	Maintenance Of Existing Traffic Signal Installation	E 05/22/02 R 07/01/15
	TRF\	851.01TS-TRAFFIC SIGNAL PAINTING.docx	Traffic Signal Painting	E 05/22/02 R 11/01/23
	TRF\	857.01TS-FULL-ACTUATED CONTROLLER IN EXISTING CABINET.docx	Full-Actuated Controller in Existing Cabinet	E 09/26/95 R 11/01/23
	TRF\	857.02TS-FULL-ACTUATED CONTROLLER AND CABINET.docx	Full-Actuated Controller And Cabinet	E 01/01/02 R 11/01/23
	TRF\	857.03TS-RAILROAD, FULL-ACTUATED CONTROLLER AND CABINET.docx	Railroad, Full-Actuated Controller And Cabinet	E 01/01/02 R 11/01/23

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	TRF\	857.04TS-UPGRADE EXISTING CONTROLLER TO NTCIP SPECIAL.docx	Upgrade Existing Controller to NTCIP Special	E 11/01/23
	TRF\	860.01TS-MASTER CONTROLLER.docx	Master Controller	E 05/22/02 R 11/01/23
	TRF\	862.01TS-UNINTERRUPTABLE POWER SUPPLY, SPECIAL.docx	Uninterruptable Power Supply, Special	E 01/01/13 R 05/19/16
	TRF\	862.02TS-UNINTERRUPTABLE POWER SUPPLY, GROUND MOUNTED.docx	Uninterruptable Power Supply, Ground Mounted	E 01/01/12 R 07/01/15
	TRF\	862.03TS-REMOVE AND REPLACE BATTERIES FOR UNINTERRUPTABLE POWER SUPPLY.docx	Remove and Replace Batteries for Uninterruptable Power Supply	E 11/01/23
	TRF\	871.01TS-FIBER OPTIC CABLE.docx	Fiber Optic Cable	E 05/22/02 R 07/01/15
	TRF\	871.02TS-SPLICE FIBER IN CABINET.docx	Splice Fiber in Cabinet	E 11/01/23
	TRF\	871.03TS-TERMINATE FIBER IN CABINET.docx	Terminate Fiber in Cabinet	E 11/01/23
	TRF\	871.04TS-FIBER OPTIC INTERCONNECT CENTER PORTS.docx	Fiber Optic Interconnect Center Ports	E 11/01/23
	TRF\	873.01TS-ELECTRIC CABLE.docx	Electric Cable	E 05/22/02 R 07/01/15
	TRF\	873.02TS-GROUNDING EXISTING HANDHOLE FRAME AND COVER.docx	Grounding Existing Handhole Frame And Cover	E 05/22/02 R 07/01/15
	TRF\	873.03TS-EVP SYSTEM LINE SENSOR CABLE, NO. 20 3C.docx	Emergency Vehicle Priority System Line Sensor Cable, No. 20 3/C	E 01/01/13 R 07/01/15
	TRF\	873.04TS-RAILROAD INTERCONNECT CABLE.docx	Railroad Interconnect Cable	E 05/22/02 R 07/01/15
	TRF\	875.01TS-TRAFFIC SIGNAL POST.docx	Traffic Signal Post	E 05/22/02 R 07/14/21
	TRF\	875.02TS-PEDESTRIAN SIGNAL POST.docx	Pedestrian Signal Post	E 01/01/20 R
	TRF\	877.01TS-MAST ARM ASSEMBLY AND POLE.docx	Mast Arm Assembly And Pole	E 05/22/02 R 07/01/15
	TRF\	877.02TS-CAMERA MOUNTING ASSEMBLY.docx	Camera Mounting Assembly	E 11/01/23
	TRF\	878.01TS-CONCRETE FOUNDATIONS.docx	Concrete Foundations	E 05/22/02 R 11/01/18
	TRF\	878.02TS-REMOVE AND REPLACE ANCHOR BOLTS.docx	Remove And Replace Anchor Bolts	E 01/01/14 R 07/01/15
	TRF\	878.03TS-CONCRETE FOUNDATION, PEDESTRIAN POST.docx	Concrete Foundation, Pedestrian Post	E 05/22/02 R 11/01/20
	TRF\	880.01TS-LED SIGNAL HEAD AND OPTICALLY PROGRAMMED LED SIGNAL HEAD.docx	Light Emitting Diode (Led) Signal Head And Optically Programmed Led Signal Head	E 05/22/02 R 07/01/15
	TRF\	880.02TS-FLASHING BEACON INSTALLATION, RELOCATION AND REMOVAL.docx	Flashing Beacon Installation, Relocation And Removal	E 01/01/07 R 07/01/15
	TRF\	880.03TS-LED SIGNAL FACE, LENS COVER.docx	LED Signal Face, Lens Cover	E 07/01/21
	TRF\	880.04TS-LED SIGNAL FACE, VISOR HEATER.docx	LED Signal Face, Visor Heater	E 07/01/21
	TRF\	880.05TS-LED MODULE REPLACEMENT.docx	LED Signal Module Replacement	E 08/01/23
	TRF\	881.01TS-LED PEDESTRIAN SIGNAL HEAD.docx	Light Emitting Diode (LED) Pedestrian Signal Head	E 05/22/02 R 07/01/15
	TRF\	882.01TS-TRAFFIC SIGNAL BACKPLATE.docx	Traffic Signal Backplate	E 05/22/02 R 07/01/21
	TRF\	886.01TS-DETECTOR LOOP.docx	Detector Loop	E 05/22/02 R 07/01/18

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	TRF\	886.02TS-DETECTOR LOOP REPLACEMENT AND OR INSTALLATION.docx	Detector Loop Replacement And/Or Installation (Roadway Grinding, Resurfacing, & Patching Operations)	E 01/01/85 R 01/05/16
	TRF\	886.03TS-RADAR VEHICLE DETECTION SYSTEM.docx	Radar Vehicle Detection System	E 07/01/15 R 05/09/17
	TRF\	886.04TS-VIDEO VEHICLE DETECTION SYSTEM.docx	Video Vehicle Detection System	E 01/01/20
	TRF\	887.01TS-EMERGENCY VEHICLE PRIORITY SYSTEM.docx	Emergency Vehicle Priority System	E 05/22/02 R 07/01/15
	TRF\	887.02TS-RELOCATE EXISTING EVP SYSTEM, DETECTOR UNIT.docx	Relocate Existing Emergency Vehicle Priority System, Detector Unit	E 01/01/02 R 07/01/15
	TRF\	887.03TS-RELOCATE EXISTING EVP SYSTEM, PHASING UNIT.docx	Relocate Existing Emergency Vehicle Priority System, Phasing Unit	E 01/01/02 R 07/01/15
	TRF\	887.04TS-OUTDOOR RATED NETWORK CABLE.docx	Outdoor Rated Network Cable	E 11/01/23
	TRF\	888.01TS-PEDESTRIAN PUSH-BUTTON.docx	Pedestrian Push-Button	E 05/22/02 R 07/01/15
	TRF\	888.02TS-ACCESSIBLE PEDESTRIAN SIGNALS.docx	Accessible Pedestrian Signals	E 04/01/03 R 11/01/23
	TRF\	890.01TS-TEMPORARY TRAFFIC SIGNAL INSTALLATION.docx	Temporary Traffic Signal Installation	E 05/22/02 R 01/01/17
	TRF\	890.02TS-TEMPORARY TRAFFIC SIGNAL TIMING.docx	Temporary Traffic Signal Timing	E 05/22/02 R 07/01/15
	TRF\	891.01TS-ILLUMINATED SIGN, LED.docx	Illuminated Sign, Led	E 05/22/02 R 07/01/15
	TRF\	891.02TS-LED INTERNALLY ILLUMINATED STREET NAME SIGN.docx	Led Internally Illuminated Street Name Sign	E 05/22/02 R 07/01/21
	TRF\	892.01TS-CELLULAR MODEM.docx	Cellular Modem	E 11/01/23
	TRF\	892.02TS-TERMINAL SERVER.docx	Terminal Server	E 11/01/23
	TRF\	892.03TS-POE EXTENDER.docx	POE Extender	E 11/01/23
	TRF\	892.04TS-LAYER II DATALINK SWITCH.docx	Layer II Datalink Switch	E 11/01/23
	TRF\	892.05TS-LAYER III NETWORK SWITCH.docx	Layer III Network Switch	E 11/01/23
	TRF\	892.06TS-CENTRACS LICENSE EXPANSION.docx	Centracs License Expansion	E 11/01/23
	TRF\	892.07TS-TACTICS LICENSE EXPANSION.docx	Tactics License Expansion	E 11/01/23
	TRF\	892.08TS-REMOTE CONTROLLED VIDEO SYSTEM.docx	Remote Controlled Video System	E 11/01/23
	TRF\	895.01TS-MODIFY EXISTING CONTROLLER CABINET.docx	Modify Existing Controller Cabinet	E 05/22/02 R 07/01/15
	TRF\	895.02TS-REMOVE EXISTING TRAFFIC SIGNAL EQUIPMENT.docx	Remove Existing Traffic Signal Equipment	E 05/22/02 R 07/01/15
	TRF\	895.03TS-MODIFY EXISTING TYPE D FOUNDATION.docx	Modify Existing Type "D" Foundation	E 01/01/02 R 07/01/15
	TRF\	895.04TS-REBUILD EXISTING HANDHOLE.docx	Rebuild Existing Handhole	E 01/01/02 R 11/01/23
	TRF\	895.05TS-REBUILD EXISTING HANDHOLE TO HEAVY-DUTY HANDHOLE.docx	Rebuild Existing Handhole To Heavy-Duty Handhole	E 01/01/02 R 07/01/15
	TRF\	895.06TS-RELOCATE EXISTING PEDESTRIAN PUSH-BUTTON.docx	Relocate Existing Pedestrian Push-Button	E 08/04/17

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FOLLOWING ARE THE CURRENT BDE SPECIAL PROVISIONS ISSUED BY THE CENTRAL BUREAU OF DESIGN AND ENVIRONMENT. PRELIMINARY AND FINAL SPECIAL PROVISIONS THAT ARE DISTRIBUTED FOR DISTRICT OR OUTSIDE AGENGY REVIEW SHOULD INCLUDE A COPY OF EACH APPLICABLE BDE SPECIAL PROVISION. FINAL SUBMITTAL TO THE CENTRAL OFFICE SHOULD ONLY INCLUDE THE BDE SPECIAL PROVISION CHECK SHEET WITH THE APPLICABLE SPECIAL PROVISIONS CHECKED

	ZD&E\	20338.docx	TRAINING SPECIAL PROVISIONS	E 10/15/75 R 09/02/21
	ZD&E\	3426I.docx	RAILROAD PROTECTIVE LIABILITY INSURANCE	E 12/01/86 R 01/01/22
	ZD&E\	5026I.docx	BUILDING REMOVAL WITH ASBESTOS ABATEMENT	E 09/01/90 R 08/01/22
	ZD&E\	5053I.docx	BUILDING REMOVAL	E 09/01/90 R 08/01/22
	ZD&E\	80029.docx	DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION	E 09/01/00 R 03/2/19
	ZD&E\	80045.docx	MATERIAL TRANSFER DEVICE	E 06/15/99 R 01/01/22
	ZD&E\	80071.doc	WORKING DAYS	E 01/01/02
	ZD&E\	80099.docx	ACCESSIBLE PEDESTRIAN SIGNALS (APS)	E 04/01/03 R 01/01/21
	ZD&E\	80127.docx	STEEL COST ADJUSTMENT	E 04/02/04 R 01/01/22
	ZD&E\	80173.doc	BITUMINOUS MATERIALS COST ADJUSTMENTS	E 11/2/06 R 08/01/17
	ZD&E\	80192.docx	AUTOMATED FLAGGER ASSISTANCE DEVICES	E 01/01/08 R 04/01/23
	ZD&E\	80198.doc	COMPLETION DATE (VIA CALENDAR DAYS)	E 04/01/08
	ZD&E\	80199.doc	COMPLETION DATE (VIA CALENDAR DAYS) PLUS WORKING DAYS	E 04/01/08
	ZD&E\	80229.doc	FUEL COST ADJUSTMENT	E 04/01/09 R 08/01/17
	ZD&E\	80241.doc	BRIDGE DEMOLITION DEBRIS	E 07/01/09
	ZD&E\	80261.doc	CONSTRUCTION AIR QUALITY-DIESEL RETROFIT	E 06/01/10 R 11/01/14
	ZD&E\	80274.docx	AGGREGATE SUBGRADE IMPROVEMENT	E 04/01/12 R 04/01/22
	ZD&E\	80302.docx	WEEKLY DBE TRUCKING REPORTS	E 06/02/12 R 11/01/21
	ZD&E\	80318.doc	TRAVERSABLE PIPE GRATE FOR CONCRETE END SECTIONS	E 01/01/13 R 01/01/18
	ZD&E\	80340.docx	SPEED DISPLAY TRAILER	E 04/02/14 R 01/01/22
	ZD&E\	80384.docx	COMPENSABLE DELAY COSTS	E 06/02/17 R 04/01/19
	ZD&E\	80391.docx	SUBCONTRACTOR MOBILIZATION PAYMENTS	E 11/02/17 R 04/01/19
	ZD&E\	80397.docx	SUBCONTRACTOR AND DBE PAYMENT REPORTING	E 04/02/18
	ZD&E\	80410.docx	TRAFFIC SPOTTERS	E 01/01/19
	ZD&E\	80422.docx	HIGH TENSION CABLE MEDIAN BARRIER	E 01/01/20 R 01/01/22
	ZD&E\	80426.docx	BITUMINOUS SURFACE TREATMENT WITH FOG SEAL	E 01/01/20 R 01/01/22
	ZD&E\	80427.docx	WORK ZONE TRAFFIC CONTROL DEVICES	E 03/02/20
	ZD&E\	80429.docx	ULTRA-THIN BONDED WEARING COURSE	E 04/01/19 R 01/01/22
	ZD&E\	80433.docx	GREEN PREFORMED THERMOPLASTIC PAVEMENT MARKINGS	E 01/01/21 R 01/01/22
	ZD&E\	80434.docx	CORRUGATED PLASTIC PIPE (CULVERT AND STORM SEWER)	E 01/01/21
	ZD&E\	80435.docx	SURFACE TESTING OF PAVEMENTS – IRI	E 01/01/21 R 01/01/23

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	ZD&E\	80436.docx	BLENDED FINELY DIVIDED MINERALS	E 04/01/21
	ZD&E\	80437.docx	SUBMISSION OF PAYROLL RECORDS	E 04/01/21 R 11/01/22
	ZD&E\	80438.docx	ILLINOIS WORKS APPRENTICESHIP INITIATIVE – STATE FUNDED CONTRACTS	E 06/02/21 R 09/02/21
	ZD&E\	80439.docx	VEHICLE AND EQUIPMENT WARNING LIGHTS	E 11/01/21 R 11/01/22
	ZD&E\	80440.docx	WATERPROOFING MEMBRANE SYSTEM	E 11/01/21
	ZD&E\	80441.docx	PERFORMANCE GRADED ASPHALT BINDER	E 01/01/23
	ZD&E\	80443.docx	HIGH TENSION CABLE MEDIAN BARRIER REMOVAL	E 04/01/22
	ZD&E\	80445.docx	SEEDING	E 11/01/22
	ZD&E\	80446.docx	HOT-MIX ASPHALT - LONGITUDINAL JOINT SEALANT	E 11/01/22 R 08/01/23
	ZD&E\	80447.docx	GRADING AND SHAPING DITCHES	E 01/01/23
	ZD&E\	80448.docx	SOURCE OF SUPPLY AND QUALITY REQUIREMENTS	E 01/02/23
	ZD&E\	80449.docx	CEMENT, TYPE IL	E 08/01/23
	ZD&E\	80450.docx	MECHANICALLY STABILIZED EARTH RETAINING WALLS	E 08/01/23
	ZD&E\	80451.docx	PORTLAND CEMENT CONCRETE	E 08/01/23
	ZD&E\	80452.docx	FULL LANE SEALANT WATERPROOFING SYSTEM	E 11/01/23
	ZD&E\	80453.docx	CONCRETE SEALER	E 11/01/23
	ZD&E\	80454.docx	WOOD SIGN SUPPORT	E 11/01/23

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.

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."

HOT-MIX ASPHALT BINDER AND SURFACE COURSE (D1)

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

Revise Article 1004.03(c) to read:

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

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

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

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

3/ The specified coarse aggregate gradations may be blended.

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

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

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

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

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

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

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

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

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

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

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

1/ Based on percent of total aggregate weight.

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

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

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

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

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

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

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

1/ Maximum draindown shall be 0.3 percent according to Illinois Modified AASHTO T 305.

2/ The draindown shall be determined at the JMF asphalt binder content at the mixing temperature plus 30°F.

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

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

5/ For surface course, the coarse aggregate can be crushed steel slag, crystalline crushed stone or crushed sandstone. For binder course, coarse aggregate shall be crushed stone (dolomite), crushed gravel, crystalline crushed stone, or crushed sandstone"

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

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

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

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

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

	Breakdown/Intermediate Roller (one of the following)	Final Roller (one or more of the following)	Density Requirement
IL-9.5, IL-9.5FG, IL-19.0 1/	V_D, P , T_B, 3W, O_T, O_B	V_S, T_B, T_F, O_T	As specified in Section 1030
IL-4.75 and SMA 3/ 4/	T_B, 3W, O_T	T_F, 3W	As specified in Section 1030
Mixtures on Bridge Decks 2/	T_B	T_F	As specified in Articles 582.05 and 582.06.

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

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

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

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

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

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

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

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.

ADJUSTMENTS AND RECONSTRUCTIONS (D1)
Effective: March 15, 2011

Revise the first paragraph of Article 602.04 to read:

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

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

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

Revise Article 603.05 to read:

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

Revise Article 603.06 to read:

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

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

Revise the first sentence of Article 603.07 to read:

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

DRAINAGE AND INLET PROTECTION UNDER TRAFFIC (D1)

Effective: April 1, 2011
Revised: April 2, 2011

Add the following to Article 603.02 of the Standard Specifications:

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

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

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

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

Revise Article 603.07 of the Standard Specifications to read:

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

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

(a) Temporary Asphalt Ramps. Temporary hot-mix asphalt ramps shall be placed around the casting, flush with its surface and decreasing to a featheredge in a distance of 2 ft (600 mm) around the entire surface of the casting.

(b) Temporary Rubber Ramps. Temporary rubber ramps shall only be used on roadways with permanent posted speeds of 40 mph or less and when the height of the casting to be protected meets the proper sizing requirements for the rubber ramps as shown below.

Dimension	Requirement
Inside Opening	Outside dimensions of casting + 1 in. (25 mm)

Thickness at inside edge	Height of casting ± 1/4 in. (6 mm)
Thickness at outside edge	1/4 in. (6 mm) max.
Width, measured from inside opening to outside edge	8 1/2 in. (215 mm) min

Placement shall be according to the manufacturer's specifications.

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

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:
- 701101-05 OFF-RD OPERATIONS, MULTILANE, 15' TO 24" FROM PAVEMENT EDGE
- 701106-02 OFF-RD OPERATIONS, MULTILANE, MORE THAN 15' AWAY
- 701601-09 URBAN LANE CLOSURE, MULTILANE, 1W OR 2W WITH NONTRAVERSABLE MEDIAN
- 701602-10 URBAN LANE CLOSURE, MULTILANE, 2W WITH BIDIRECTIONAL LEFT TURN LANE
- 701701-10 URBAN LANE CLOSURE, MULTILANE INTERSECTION
- 701801-06 SIDEWALK, CORNER OR CROSSWALK CLOSURE
- 701901-08 TRAFFIC CONTROL DEVICES
- 704100-08 TEMPORARY CONCRETE BARRIER
- 780001-05 TYPICAL PAVEMENT MARKINGS

DETAILS:
- TC-10 TRAFFIC CONTROL AND PROTECTION FOR SIDE ROADS
- TC-11 TYPICAL APPLICATIONS RAISED REFLECTIVE PAVEMENT MARKERS (SNOW-PLOW RESISTANT)
- TC-14 TRAFFIC CONTROL AND PROTECTION AT TURN BAYS (TO REMAIN OPEN TO TRAFFIC)
- TC-16 PAVEMENT MARKING LETTERS AND SYMBOLS FOR TRAFFIC STAGING
- TC-21 DETOUR SIGNING FOR CLOSING STATE HIGHWAYS
- TC-22 ARTERIAL ROAD INFORMATION SIGN
- TC-24 CITY OF CHICAGO PAVEMENT MARKINGS
- TC-26 DRIVEWAY ENTRANCE SIGNING

SPECIAL PROVISIONS:
- MAINTENANCE OF TRAFFIC
- TRAFFIC CONTROL AND PROTECTION, (SPECIAL)
- TEMPORARY ACCESS (COMMERCIAL ENTRANCE)
- PAVEMENT MARKING BLACKOUT TAPE (BDE)
- PAVEMENT MARKING REMOVAL (BDE)

- TEMPORARY PAVEMENT MARKING (BDE)
- TRAFFIC CONTROL DEVICES – CONES (BDE)
- WORK ZONE TRAFFIC CONTROL DEVICES (BDE)

FRICTION AGGREGATE (D1)

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

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

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

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

Use	Mixture	Aggregates Allowed
Class A	Seal or Cover	Allowed Alone or in Combination [5/]: Gravel Crushed Gravel Carbonate Crushed Stone Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag Crushed Concrete
HMA Low ESAL	Stabilized Subbase or Shoulders	Allowed Alone or in Combination [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	Allowed Alone or in Combination [5/ 6/]: Crushed Gravel Carbonate Crushed Stone[2/] Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Concrete[3/]

<table>
<tr><th>Use</th><th>Mixture</th><th>Aggregates Allowed</th></tr>
<tr><td>HMA
High ESAL
Low ESAL</td><td>C Surface and Binder
IL-9.5
IL-9.5FG
or IL-9.5L</td><td><u>Allowed Alone or in Combination</u> [5/]:

Crushed Gravel
Carbonate Crushed Stone[2/]
Crystalline Crushed Stone
Crushed Sandstone
Crushed Slag (ACBF)
Crushed Steel Slag[4/]
Crushed Concrete[3/]</td></tr>
<tr><td rowspan="5">HMA
High ESAL</td><td rowspan="5">D Surface and Binder
IL-9.5
or IL-9.5FG</td><td><u>Allowed Alone or in Combination</u> [5/]:

Crushed Gravel
Carbonate Crushed Stone (other than Limestone)[2/]
Crystalline Crushed Stone
Crushed Sandstone
Crushed Slag (ACBF)
Crushed Steel Slag[4/]</td></tr>
<tr><td><u>Other Combinations Allowed:</u>

Up to... | With...</td></tr>
<tr><td>25% Limestone | Dolomite</td></tr>
<tr><td>50% Limestone | Any Mixture D aggregate other than Dolomite</td></tr>
<tr><td>75% Limestone | Crushed Slag (ACBF) or Crushed Sandstone</td></tr>
<tr><td rowspan="2">HMA
High ESAL</td><td rowspan="2">E Surface
IL-9.5

SMA
Ndesign 80
Surface</td><td><u>Allowed Alone or in Combination</u> [5/ 6/]:

Crushed Gravel
Crystalline Crushed Stone
Crushed Sandstone
Crushed Slag (ACBF)
Crushed Steel Slag

No Limestone.</td></tr>
<tr><td><u>Other Combinations Allowed:</u>

Up to... | With...</td></tr>
</table>

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

APPENDIX B

CHICAGO DEPARTMENT OF WATER MANAGEMENT
STANDARD SPECIFICATIONS

CITY OF CHICAGO
Department of Water Management

AS BUILT - RECORD DRAWINGS FORM

The contractor will be required to submit "as-built plans" / record drawings of all new sewers and sewer structures that will be owned and maintained by the City. These "as-built plans" / record drawings should be sealed by a registered land surveyor and/or a registered professional engineer and **submitted within three weeks after the completion of the sewer work**. These "as-built plans" / record drawings should be forwarded to the Department of Water Management, Bureau of Engineering Services, Sewer Design Section located at 1000 East Ohio Street, Elevation +51, Room 313, Chicago, Illinois 60611 along with a copy of this form, the coinciding sewer permit and video tape, as applicable.

Drainlayer's Name: ________________________ Phone No.:

Drainlayer's Signature:

Date of Project Completion:

Date Submitted As-Built Plan / Record Drawing:

- -

FOR OFFICE USE ONLY:

Project Manager: ________________________ Phone No.:

Project Name:

Project No. and/or Contract No.:
(i.e., CDOT, IDOT, COUNTY)

Project Location:

Issues By: ____________________________ Date:

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APPENDIX C

CHICAGO DEPARTMENT OF TRANSPORTATION
STANDARD SPECIFICATIONS

CITY OF CHICAGO
BUREAU OF STREETS
SPECIAL PROVISION
FOR
JOINTING P.C. CONCRETE PAVEMENT AND P.C. CONCRETE BASE

EFFECTIVE MAY 1, 1981

TRANSVERSE JOINTS. The number and (or) locations of new and existing structures vary in practically every street block of similar length, width and configuration within a project. Although each block must be dealt with individually, the appearance of the general transverse joining scheme and the treatment of structures is to be as uniform as possible for the entire project.

After all structure castings have been adjusted to the finished pavement grade and the concrete pavement has been poured, transverse contraction joints must be cut or formed in the pavement using acceptable methods and at a time specified by the Engineer.

The primary transverse contraction joints must be located in line with the center of (1) designated city sewer manhole structure castings, and (2) city seer catch basin structure castings that are transversely opposite to each other. The transverse joints established at these city sewer structures and the expansion joints that define the street intersections must be control joints. However, at no time may these control joints be closer than 10' to one another. If this occurs, in one case, due to the proximity of two existing structure castings to one another, one structure casting must be designated for the control joint and other structure casting must be isolated. In the other case, when a structure casing (e.g., Sewer Manhole) is less than 10' from and expansion joint, the structure casting must be isolated.

All other transverse joints must be divided between control joints and have a maximum spacing interval of 20'. The minimum allowable distance between transverse joints must be 10'.

STRUCTURE ISOLATION. The isolation of structures (Catch basins, Manholes, City and Public Utility Vaults, etc.) will be permitted only when necessary as based on criteria contained herein and then only at the direction of the Commissioner. The side(s) of any necessary isolation box(es) will be made part of the transverse and/or longitudinal joining scheme when possible and practical.

TREATMENT OF STRUCTURES AND TRANSVERSE JOINT LOCATION ADJUSTMENT.

Following are various conditions that will be encountered and procedures to be used for construction:

Structure Castings (e.g., Sewer Manhole) Intersected by Longitudinal Joints.

When a longitudinal joint either bisects a structure casting or intersects within 6" of the center of the casting, do not isolate the structure.

In the above case where the structure casting is not bisected, the longitudinal joint must start deviating from its normal position at the intersection with the nearest transverse joints on either side of the structure and must then extend as a straight line to the center of the structure casting.

When a longitudinal joint intersects a structure casting but neither bisects it, nor intersects within 6 inches of its center, the structure must be isolated.

If it is a control structure (e.g., Sewer Manhole) the position of the transverse control joint that normally bisects it must be adjusted longitudinally to form one of the standard structure isolation box. This transverse control joint must be located 12” from the upper external casting edge in the direction that provides joint spacings between the next immediate control points that meet criteria set forth earlier.

Structure Casting (e.g., Sewer Manhole) that must be isolated and is Transversely Opposite a Pair of Catch basins.

When a sewer manhole structure transversely opposite a pair of catch basins must be isolated, the position of the catch basins is to be adjusted longitudinally so that the transverse control that bisects them will form a side of the standard structure isolation box.

When there is latitude in the drainage design scheme that permits the choice of adjusting the position of this transverse control joint 12” to either side of the upper external casting edge, the movement must be in the direction that provides joint spacings between the next immediate control joints that meets criteria set forth earlier.

Structure Casting Within a Panel.

When any joint on any external casing edge is not closer than 12” but no further than 18” from a joint (longitudinal and/or transverse) the structure is to be isolated and the transverse and/or longitudinal joint is to form a side of the standard isolation box.

When a longitudinal joint does not intersect any part of the structure casting but the distance between said joint and the upper external casting edge is less than 12”, one of the following treatments is to be selected based on the various controlling criteria and conditions:

Do not isolate. Adjust the position of the transverse joint longitudinally to bisect structure casting. Adjust panel spacing between control joint that meets criteria set forth earlier.

Isolate structure casing and adjust the position of the transverse joint longitudinally to form a side of the Standard Isolation Box. The movement must be in the direction that provides joint spacing between the next immediate control joints that meets criteria set firth earlier.

Isolate structure according to the Standard Details without adjusting transverse joint location.

When the upper external casting edge is over 18” from any joint, either transverse or longitudinal, the structure must not be isolated but the concrete is to be placed against and around the structure casting.

When a structure must be isolated and the distance between the side of the Standard Isolation Box and an immovable joint is 18” or less, extend the adjacent sides of the box to intersect said joint making it a side of the box. If this distance is more than 18” isolate the structure according to the Standard Detail for Isolation of Structure Castings.

Structure Casting Isolation in Gutter Line.

When a structure casting (e.g., Sewer Catch basin) in the gutter line must be isolated, and it is a control structure, the transverse joint at this location is to form one side of the isolation box. If the location of the catch basin can be adjusted longitudinally, it must be moved in the direction that provides the most advantageous position to any structures or isolation boxes opposite it in pavement and optimum joint spacings between the next immediate control points.

OPERATION OF TRAFFIC SIGNALS

Existing traffic control signal installations and/or any electrical facilities at certain intersections included in this section may be altered or reconstructed totally or partially as part of the work on this section. The Contractor is hereby advised that all traffic control equipment presently installed at these locations may be the property of the City of Chicago.

The Contractor is further advised that the existing traffic signals, or the existing temporary installation, must remain in operation during all construction stages except for the most essential down time. Any shutdown of the installation for a period exceeding fifteen (15) minutes must have the prior approval of the Commissioner. Such approval will generally only be granted during the period extending from 10:00 A.M. to 3:00 P.M. on weekdays. Any other traffic signal shutdown outside of the 10:00 A.M. to 3:00 P.M. weekday period must have prior approval of the Commissioner.

The Contractor, prior to the commencement of his work must notify the City of Chicago of his intent to perform his work. Upon request from the Contractor, the City of Chicago will locate any buried conduit or other electrical facility which may interfere with the Contractor's operations without charge to him. This will in no way relieve the Contractor's responsibility to repair and/or replace electrical facilities damaged by his operations.

Any known or suspected damage to the electrical facility must be reported immediately to the Commissioner. The Contractor will be held fully responsible for the repair and/or temporary repair if, in sole opinion of the Commissioner, such damage was caused by the negligence of the Contractor, his agents, or employees. The City of Chicago, at its own discretion, may call upon the City of Chicago's Electrical Maintenance Contractor to make any such repair and/or replacements at the total expense of the Contractor for this Section.

No part of this special provision may be construed as exempting the Contractor from his duty to follow careful construction practices, including all standard provisions in the Standard Specifications.

The intent of this special provision is to prescribe a procedure wherein a Contractor may obtain formal approval of a traffic signal installation at a given intersection, and a release from maintenance responsibility for the new materials installed, in order to be permitted to disconnect and remove the old traffic signal equipment.

When the road is open to traffic, except under conditions where existing traffic signals are being maintained or when a temporary traffic signal installation has been installed, the Contractor may request a turn-on and inspection of the completed traffic signal installation at each separate location. This request must be made to the City of Chicago, a minimum of three (3) working days prior to the time of the requested inspection. Upon demonstration that the signals are operating and all work is completed in accordance with the Contract and to the satisfaction of the Commissioner, the Bureau of Electricity's inspector will then allow the signals to be placed into continuous operation. The Agency that is responsible for the maintenance of each traffic signal installation will assume the maintenance upon successful completion of this inspection.

TRAFFIC SIGNAL TURN-ON

The intent of this Special Provision is to prescribe a procedure whereby a Contractor may obtain formal approval of a traffic signal installation at a given intersection, and a release from maintenance responsibility for the new materials installed, in order to be permitted to disconnect and remove the old traffic signal equipment.

When the road is open to traffic, except under conditions where existing traffic signals are being maintained or when a temporary traffic signal installation has been installed, the Contractor may request a turn-on and inspection of the completed traffic signal installation at each separate location. This request must be made to the City of Chicago, a minimum of three (3) working days prior to the time of the requested inspection. 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 Bureau of Electricity's inspector will then allow the signals to be placed into continuous operation. The Agency that is responsible for the maintenance of each traffic signal installation will assume the maintenance upon successful completion of this inspection.

APPENDIX D

CHICAGO DEPARTMENT OF TRANSPORTATION
DIVISION OF ELECTRICAL ENGINEERING MATERIAL SPECIFICATIONS

ELECTRICAL SPECIFICATION 1351
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED AUGUST 27, 2013

WIRE: SINGLE CONDUCTOR NO. 12 COPPER WITH CROSS LINKED POLYETHYLENE INSULATION

SUBJECT

1. This specification states the requirements for insulated wire intended for use as a conductor to connect street light luminaires to aerial distribution wires or underground distribution cables in a street lighting circuit. This wire is also known as pole wire.

GENERAL

2. (a) Specifications. The cable shall conform in detail to the requirements herein stated and to the latest referenced specifications of the following organizations:

American Society for Testing and Materials (ASTM)
Insulated Cable Engineers Association (ICEA)
National Electric Code (NEC)
National Electrical Manufacturers Association (NEMA)
Underwriters Laboratories (UL)

(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 provided under this specification, shall be submitted to the Engineer of Electricity within fifteen (15) business days after receipt of the request.

(d) Warranty. The manufacturer shall warrant the cable to be first class material throughout. The manufacturer will be responsible for any cable failing during normal and proper use within one (1) year after the date of installation. The manufacturer will provide replacement of any failed cable segment, from the point of normal termination to the next point of normal termination. There will be no cost to the City.

CABLE

3. (a) Construction. The cable shall consist of an uncoated copper conductor concentrically encased in a moisture resistant thermosetting plastic of cross linked polyethylene. The cable shall be listed with UL as Type RHW-2 or Type USE-2, and shall meet the NEC's requirements for these types of cable up to 90º C in wet or dry locations.

(b) Color. Cable will be either black, red, or green.

(c) Marking. The cable must be identified by a permanently inscribed legend in white lettering. The legend must have the following information at a minimum: 1/C #12AWG, 600V, XLPE, 90º, RHW-2 orUSE-2, manufacturer's name, date of manufacture. The legend must be repeated at approximately eighteen inch (18") intervals parallel to the longitudinal axis of the cable.

(d) Overall cable diameter shall be approximately 0.19 inches.

CONDUCTOR

4. (a) Material. Conductor shall be Number 12 AWG consisting of seven (7) strands of uncoated copper wires (.0305 inch diameter) per ASTM-B3.

(b) Resistivity. Conductor shall conform to the requirements of ASTM B-33.

INSULATION

5. (a) Type. The insulation shall be a cross linked polyethylene compound meeting the physical and electrical requirements herein specified and the requirements of NEMA WC-70 (ICEA S-95-658).

(b) Thickness. The insulation must be circular in cross section and have an average thickness of 45 mils. The thickness must not vary by more than plus or minus five percent (+/-5%).

TESTS

6. (a) General. The tests required to determine compliance with this specification must be certified by the manufacturer or an independent testing facility. Before shipment, copies of the test reports must be forwarded to the Division of Engineering for approval. The City reserves the right to reject any cable failing to meet the requirements of the tests. Tests must be made in accordance with methods in ASTM D-470.

(b) Physical Properties

Initial Values:

Tensile strength, minimum psi	2000
Elongation at rupture, minimum %	250

After Aging:

After 168 hours in an air oven at 121° +/-1°C:

Tensile strength, minimum % of initial value	80
Elongation at rupture, minimum % of initial value	80

(c) Modulus Test. After initial conditioning period of four (4) minutes at a temperature of 150° C and at 100% elongation, the modulus must not be less than 110 pounds per square inch.

(d) Accelerated Water Absorption Characteristics.

1. Electrical Method. After twenty-four (24) hours immersion in tap water at 75° +/- 1° C, the specific inductive capacity of the insulation must not be more than 7. After a continued fourteen (14) day immersion, the specific inductive capacity must not be more than three percent (3%) higher than the value determined at the end of the first day, nor more than two percent (2%) higher than the value determined at the end of the seventh day.

2. 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° C for a period of seven (7) days.

(e) Electrical Characteristics. Each completed length of insulated conductor must withstand a test voltage of 3000 volts AC for a period of five (5) minutes after immersion in water for not less than six (6) hours and while still immersed. After withstanding this dielectric test, the cable must have an insulation resistance constant of not less than 25,000.

(f) Cold Bend Test. The cable must pass the cold bend, long-time voltage test on short specimens as outlined in ASTM D-470.

PACKING

7. (a) Sealing. Both ends of each length of cable must be thoroughly sealed to prevent the entrance of moisture and other foreign matter.

(b) The cable must be delivered in coils containing five hundred (500) feet each. Each coil must be packed in individual dispenser cartons. Each carton must be labeled, identifying the cable type and size, manufacturer, and date of manufacture.

ELECTRICAL SPECIFICATION 1375
DIVISION OF ELECTRICAL OPERATIONS
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED MARCH 11, 2022

BASE: BALLAST HOUSING, NO. 7 U.S. STANDARD GAUGE STEEL

SUBJECT

1. This specification states the requirements for ballast housing base assemblies to be installed on concrete foundations and to serve as bases for anchor base type steel poles with mast arm attached street light luminaires.

GENERAL REQUIREMENTS

2. (a) Specifications. The base assemblies shall conform in detail to the requirements herein stated and to the specifications of the American Society for Testing and Materials, of which the latest published revisions will govern.

(b) Acceptance. Base assemblies not conforming to this specification will not be accepted.

(c) Drawings. The drawing mentioned herein is a drawing of the Department of Transportation. It is an integral part of this specification cooperating to state necessary requirements.

(d) Shop Drawing. One complete set of shop drawings of the base assembly intended to be furnished must be submitted within fifteen (15) days upon request of the Chief Procurement Officer.

(e) Sample. One completely assembled base of the manufacture intended to be furnished must be submitted upon request of the Chief Procurement Officer within fifteen (15) days after receipt of the request.

DETAIL REQUIREMENTS

3. (a) Drawing. The base assembly must conform in detail to the design and dimensions shown on Drawing No. 785, dated March 25, 1977.

(b) Material. The steel used in the fabrication of the base assemblies must conform to ASTM A606 Type 4 for the sides and door and to ASTM A871 Grade 65 for the top, bottom and anchor plates.

(c) Thickness. The sides and door must be No. 7 U.S. Standard Gauge; the top, bottom and Anchor Plates must be 3/4 inch plate.

(d) Door. The door must be drilled top and bottom for, and furnished with, four (4) 1/4-20NCX3/4" button head stainless steel tamper resistant bolts for fastening top and bottom of door to base as shown on drawing No. 785. Ten (10) wrenches or drivers to fit the door bolts must be furnished with each fifty (50) base housings.

(e) Hardware. The bolts, nuts, lock washers and anchor plates must conform to the drawing. Four (4) galvanized hex head machine bolts, four (4) galvanized hex nuts, four (4) galvanized lock washers, and two (2) 3/4" thick steel anchor plates must be furnished with each base assembly. The anchor plates must be shipped bolted to the top of the ballast housing assembly using the hardware enumerated above.

(f) Welding. 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. Each bidder must submit with his proposal a drawing showing the sizes and types of welds, the type of electrode and the welding methods he proposes to use in fabricating the base assembly.

(g) Sandblasting. The door and ballast housing shall be thoroughly sand blasted to remove all scale, oil or slag prior to painting.

(h) Dating. The top of the ballast housing base must be stamped or engraved with the year of manufacture in numerals not less than 1/2" in height.

(i) Painting. A coat of oil-based rust-inhibiting paint shall be applied on the inside weld of the base. The complete base assembly, inside and outside, is to be given a coat of iron oxide zinc chromate primer meeting the requirements of SSPC-Paint 25.

TESTING

4. (a) Chemical Composition. Certified reports from the steel manufacturer must be furnished to the City upon request of the Chief Procurement Officer.

(b) Test Specimens. Shall conform to the requirements of ASTM Specifications A871 Grade 65 and A606 Type 4.

(c) Strength Tests. One test specimen of the metal in each order of 50 base assemblies or less shall be tested for tensile strength and elongation, in accordance with ASTM Standards.

(d) Welding Tests. One percent (1%) of the longitudinal and circumferential welds of the base assembly shall be inspected for penetration and soundness of the welds by the magnetic particle inspection method or by radiography. If the magnetic inspection process is used, the dry method with 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.

(e) Certificate. One certified copy of the test data sheet must be furnished to the City before delivery of the bases.

PACKING

5. When packed for transportation and delivery as per paragraph 3(e), the base assemblies must be thoroughly blocked or otherwise protected to prevent damage to painted surfaces.

ELECTRICAL SPECIFICATION 1385
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED AUGUST 12, 2013

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. 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. 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 filet. 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) Oil and Grease Removal. All metal surfaces shall be washed with an alkaline detergent to remove any oils or grease.

(b) Chemical Pretreatment. The cleaned metal surfaces must then be treated with a hot, pressurized phosphate wash and must be dried by convection heat.

(c) Coat. A thermosetting, weathering, polyester powder coat shall be applied electrostatically to all cleaned and treated exterior surfaces to a uniform four mil (4) thickness in a one coat application. This powder coat must be cured in a convection oven at a minimum temperature of 400º Fahrenheit to form a high molecular weight fusion bonded finish.

(d) Alternate Methods. Alternate powder coat 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.

(e) Durability. The coating shall be capable of passing 1,000 hours of salt spray exposure as per ASTM B117 in a 5% NaCl (by weight) solution at 95º Fahrenheit and 95% relative humidity without blistering. Before testing, the test panel must be scribed with an "X" down to bare metal.

(f) Coating Measurement. Measurement of coating thickness shall 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 (2) square inches must not be less than 3 mils.

(g) Color. Color shall be gloss black unless identified otherwise in the order. A color sample must be submitted for approval prior to fabrication. This color sample must include the manufacturer's name and the manufacturer's color name.

PACKING

5. Each pedestal shall be individually wrapped to prevent damage to the surface. Each pedestal shall be suitably packed or blocked to prevent damage during shipment and handling.

ELECTRICAL SPECIFICATION 1407
DIVISION OF ENGINEERING
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, 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 at 2451 South Ashland.

(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 180º 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.

ELECTRICAL SPECIFICATION 1428
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
SEPTEMBER 11, 1989

THERMAL MAGNETIC CIRCUIT BREAKER

SUBJECT

1. This specification covers the requirements for thermal-magnetic circuit breakers capable of providing complete over-current protection for street lighting branch-load and service circuits.

GENERAL REQUIREMENTS

2. (a) Sample. One complete circuit breaker of each type and size, and of the manufacture intended to be furnished must be submitted upon request of the Chief Procurement Officer within fifteen (15) business days after receipt of such request. The sample(s) shall be delivered to the Division of Electrical Operations, 2451 South Ashland Avenue, Chicago, Illinois 60608.

(b) U.L. Approval. Circuit breakers furnished under this specification shall be listed and approved by Underwriter's Laboratories, Inc.

(c) Applicable Specifications. Where reference is made to applicable requirements of Underwriter's Laboratories, Inc., Bulletin #489, entitled "Standard for Branch Circuit and Service Circuit Breakers," hereinafter cited as the U.L. Standards, the most recently published revision will govern.

(d) Assembly. Each circuit breaker must have the thermal-magnetic trip installed, calibrated and sealed within its insulated housing.

(e) Instructions. Complete installation instructions, details on wiring, and information on operation shall be furnished with each circuit breaker, except as otherwise indicated.

(f) Packing. Each circuit breaker shall be packed in a suitable manner so that it will not be damaged in shipping or handling.

TYPES AND SIZES

3. (a) EHD Frame Circuit Breakers. For use on A-C Systems with a 100-ampere frame; minimum interrupting rating of 18,000 R.M.S. symmetrical amperes at 240 volts A.C.

1. Single pole, 240 or 480 volts A.C., ampere rating from 15 to 100.

2. Double pole, 240 or 480 volts A.C., ampere rating from 15 to 100.

(b) FDB Frame Circuit Breakers. For use on A-C Systems with a 150 ampere frame; minimum interrupting capacity of 18,000 R.M.S. symmetrical amperes at 240 volts A-C.

1. Double pole, 240, 480 or 600 volts A-C, ampere rating from 15 to 150.

2. Triple pole, 240, 480 or 600 volts A-C, ampere rating from 15 to 150.

(c) JDB Frame Circuit Breakers. For use on A-C Systems with a 250 ampere frame; minimum interrupting current of 65,000 R.M.S. symmetrical amperes at 240 volts A-C.

1. Double pole, 240, 480 or 600 volts A-C, ampere ratings from 70 to 250.

2. Triple pole, 240, 480 or 600 volts A-C, ampere ratings from 70 to 250.

DESIGN AND CONSTRUCTION

4. Circuit breakers furnished under this specification must include the following design and construction features: (1) molded insulated housing, (2) thermal-magnetic trip mechanism, (3) silver alloy contacts, (4) corrosion-resistant internal parts, (5) trip-free, indicating handle, and (6) pressure-type terminals.

DETAIL REQUIREMENTS

5. (a) Thermal-Magnetic Trip Mechanism. The breaker must be activated on current overload by means of a thermal-magnetic trip mechanism. This mechanism must be non-adjustable, non-interchangeable, and factory calibrated and sealed. Instantaneous tripping as controlled by the magnetic trip setting, and time delay tripping accomplished by thermal action must be in accordance with the manufacturer's published characteristic curves for these breakers or with calibration requirements of the U. L. Standards, as applicable.

(b) Contact Mechanism. The contacts must be spring loaded and provide a quick-make, quick-break non-teasing action. The contact mechanism must be such that the breaker will trip open even if the handle is held or locked in the ON position.

(c) Calibration. Rating and performance of these breakers must be based on calibration at an ambient temperature of 40° C. (104°F.).

(d) Rated Current. Each breaker must be capable of carrying 100% rated current continuously in its calibrated ambient temperature without tripping and without exceeding the temperature limits specified in the U. L. Standards.

(e) Contacts. The contacts must be made of a non-welding silver alloy or equivalent, subject to approval.

(f) Internal Parts. All internal parts of these circuit breakers shall be corrosion resistant material.

(g) Terminals. Solderless, pressure type terminals of copper construction must be provided for both line and load connections.

(h) Handle Indication. The handle must indicate clearly whether the circuit breaker is on the ON, OFF, or TRIPPED position.

(i) Mounting. Breakers furnished under this specification must have drilled and counterbored holes for front mounting which must conform to spacings shown on Department of Transportation Drawings numbered 883, 884, 886, and 887.

(j) Test Requirements. These breakers must be capable of meeting the following sequence of test requirements as specified in the U. L. Standards.

1. Endurance test.

2. Calibration test at 200% and 125% of rated current.

3. Short circuit tests

4. Calibration test at 500% rated current.

5. Dielectric strength test.

WARRANTY

6. Circuit breakers furnished under this specification shall be warranted by the manufacturer against defects in materials or workmanship for a period of one year after installation. During this period, should a failure occur, repair or replacement must be made without cost to the City.

ELECTRICAL SPECIFICATION 1443
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED JULY 11, 2006

SECONDARY RACK, 2 OR 3 WIRE, WITH INSULATORS

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SUBJECT

1. This specification covers the requirements for 2 and 3 wire secondary racks complete with insulators for attachment to street lighting poles for the purpose of supporting aerial circuit wires.

GENERAL

2. (a) Specifications. Each 2 or 3 wire secondary rack 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. Secondary racks not conforming to this specification will not be accepted.

(b) Sample. If requested, each bidder shall submit with his proposal one complete sample secondary rack with insulators for approval by the Commissioner. The sample must be submitted within fifteen (15) business days of such request from the Chief Procurement Officer.

(c) Warranty. Secondary rack and pole clamps furnished under this specification shall be warranted against failure from defects due to materials or workmanship for a period of one year after delivery. In the event of failure of any of the components, the manufacturer will replace the rack, at no cost to the City.

SECONDARY RACK

3. (a) General Design. The secondary rack shall be the medium duty type with extended back. It shall be suitable for either 2 or 3 wire, as indicated in the bid proposal, with 8-inch spacing between centers of the clevises.

(b) Back Section. The back section of the secondary rack must be made from hot-wrought merchant quality carbon steel 1/8 inch thick. The steel must conform with ASTM Specification A 575, Grade M1010. The back must

be formed to the shape of an inverted trough, the flat portion of which must be approximately 1-1/4 inches in width. Mounting slots, 11/16 inch by 1-1/4 inch, must be longitudinally centered on the flat of the back section and located so as to coincide with the centers of the clevises, with additional slots provided at the top and bottom. The 2-wire back must be at least 18 inches in length. The 3-wire back must be at least 24 inches in length.

(c) Clevises. Clevises must be made from 1/8 inch thick steel strip of the same material as the back section, and so formed to fit the back snugly. The prongs of the clevis must be approximately 4 inches apart and formed to the shape of an inverted trough, the flat portion of which must be approximately 3/4 inch in width with the edges pitched at an angle of 30^{o} with the flat portion. Each clevis shall be fabricated in such a manner that the pitched edges of both prongs must slope in the same direction. The clevises must be riveted to the back section with two (2) 5/16 inch steel rivets.

(d) Rack Bolt. The rack bolt must be a 9/16 inch diameter button head bolt made of hot-wrought carbon steel conforming with the requirements of ASTM Specification A 576, Grade 1040, complete with a 1/4 inch by 2 inch brass cotter pin at the bottom end. Centerline of the rack bolt must be located 4 inches out from the face of the back section.

(e) Spool Insulators. Spool insulators must be electrical grade white or gray glazed porcelain.

(f) After fabrication, the secondary rack, clevises, and all steel hardware must be hot dip galvanized according to ASTM 123. Bolts, washers, and nuts must be hot dipped galvanized according to ASTM 153.

TESTS

4. At the discretion of the Commissioner, secondary racks furnished under this specification will be subject to testing to determine compliance with the strength requirements of ANSI medium type secondary racks.

ELECTRICAL SPECIFICATION 1447
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED JANUARY 22, 2020

POLE: ANCHOR BASE, 3 AND 7 GAUGE, TAPERED TUBULAR STEEL, WITH HANDHOLE ENTRY

SUBJECT

1. This specification states the requirements for tapered, tubular, 3 gauge and 7 gauge steel anchor base poles with mast arm supports. They will support street light luminaires and/or traffic signal mast arms and will be served by underground cables.

GENERAL

2. (a) Specifications. The poles shall conform in detail to the requirements herein stated, and to the requirements of the following organizations cited herein, of which the most recent revisions shall govern:

American Association of State Highway and Transportation Officials (AASTHO)
American National Standards Institute (ANSI)
American Society for Testing and Materials (ASTM)
American Welding Society (AWS)
Society for Protective Coatings (SSPC)

(b) Acceptance. Poles not conforming to this specification will not be accepted.

(c) Bidders Drawings. Bidders shall submit with their bids detailed scale drawings of the mast 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 must also be submitted in electronic format, preferably MicroStation, if 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 completely

assembled anchor-base pole of the manufacture intended to be furnished, must be submitted for review within fifteen (15) business days of receiving the request.

(f) Warranty. The manufacturer shall warrant the performance and construction of the light poles to meet the requirements of this Specification and must warrant all parts, components, and appurtenances against defects due to design, workmanship, or material developing within a period of five years after the light poles 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 anchor base pole shall consist of a steel mast with handhole entry, entry door with machine screws, grounding nut, mast base plate, top cap for mast, two (2) mast arm supports, bolt covers, and all necessary hardware required for complete assembly of these parts, ready for assembly, without special tools.

(b) Interchangeability. Members of each pole type shall 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 pole.

(c) Design. Each pole type shall conform in design and dimensions to the pertinent drawing(s) listed in Table "A".

MASTS

4. (a) Mast Size. The outside diameters of the mast of each pole type shall be as listed in Table A. The mast must be tapered at 0.14 inches per foot.

(b) Material. The mast must be fabricated from one length of No. 3, No. 7, or No. 11 Standard gauge steel meeting the material 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 must 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 mast must be fabricated with not more than one (1) longitudinal weld. The weld shall be ground smooth so that it is virtually invisible. There shall be no lateral welds in the masts other than where the masts are welded to the steel bases.

Each mast must be straight and centered on its longitudinal axis. Each mast must be formed on a mandrel and worked to form a round cross-section. The completed, unpainted masts shall have smooth external surfaces free from protuberances, dents, cracks or other imperfections marring their appearance.

(d) Base. The mast base shall be a steel plate, of low alloy, high strength steel as noted in Par. 4 (b).

Plate Base. The base plate for each pole type shall be as listed in Table "A". It must be fabricated from the same ASTM A606 low alloy, high strength steel as is used for the mast. After fabrication the steel must meet the requirements of ASTM A588. The mast must be inserted into the base to a maximum depth which will still allow for an adequate weld to be made between the bottom of the mast and the plate. A circumferential weld must be made between the mast and the base at both the top and underside of the plate. Non-metallic removable bolt covers which completely cover the anchor bolts and nuts shall be provided. The covers must be attached with stainless steel screws coated with a non-seizing compound, or another type of non-seizing fastener, as approved by the Commissioner. The covers shall enclose the anchor bolts and be secured in an approved manner. The base shall be attached to the mast so that the bearing surface of the base is at right angles to the longitudinal axis of the mast. The vertical center line of the seam must be positioned so that no welds for the simplex attachments or the handhole opening will go through the seam.

Anchor Rod Openings. All anchor rod openings for each pole type shall have a width as listed in Table "A". Each opening must be sized to have a circumferential slot length equal to 15˚ of the circumference.

(e) Mast Arm Support Plates. The mast arm support plates will be made of cast steel conforming to the requirements for Grade 65-35 cast steel of ASTM A27, or equivalent, subject to approval. They shall neatly fit the external surface of the mast. The upper mast arm support plate must have a hollow protuberance, the hole of which must be approximately equivalent to two (2) inches in diameter, extending into the interior of the pole providing a smooth surface for the lamp cables to rest upon. The mast arm support plates shall be designed so that they will carry the mast arm and hold it in the proper position for fastening the mast arm to the mast. The design of the mast arm support plates must be a two (2) bolt type as shown on Drawing No. 659.

(f) Provision for Ground. A 1/2-13 UNC (unified thread – course ANSI B1.1) square nut must be welded to the inside of the mast on the handhole entry frame for a ground connection.

(g) Entry. A vertical doorframe carrying a removable door providing access to the interior of the mast must be welded into a close fitting opening centered approximately 15 inches above the bottom of the base. The doorframe must be formed and welded of steel with a cross section of two and one-quarter (2-1/4) inches wide by one-quarter (1/4) inch thick to adequately reinforce the opening of the mast. The internal horizontal clearance of the doorframe must be four and three-quarter (4-3/4) inches; its internal vertical clearance must be seven (7) inches. Its upper and lower ends must be semi-circular meeting its straight sides tangentially. The radius of this opening must be two and three-eighths (2-3/8) inches. The vertical center line of the entry must be at a right angle clockwise from the vertical center line of the mast arm supports. The frame must have two welded tabs; one at the top and one at the bottom of the door frame. These tabs must be drilled and tapped to accept a 1/4-20 UNC screw. The top hole must be located 13/16 of an inch from the top of the opening. The bottom hole must be located 13/16 of an inch from the bottom of the opening. The 1/4-20 UNC machine screws must be stainless steel with hex heads, meeting the requirements of ASTM A193. The screws shall be treated with a compound to prevent seizing. Other non-seizing types of screws and fasteners may be considered. An alternate method of attachment consisting of a removable hinge on the bottom with a screw connection at the top may be considered. (The above requirements apply to all pole masts except those with a 10 inch bolt circle. Poles with 10 inch bolt circles must have handhole openings of 3" by 5". All other requirements apply.)

(h) Door. The removable door must be formed of sheet steel approximately one-eight (1/8) inch thick. It shall be flat or dished depending upon the pole type, and fit the doorframe closely so that it will stay in proper position even if its locking screws are slightly loosened. The door must be drilled top and bottom to accept the 1/4-20 UNC hex head machine screws which will fasten the door to the doorframe. A half-circle piece of steel must be welded by the screw opening, to allow only a socket wrench to be used. All doors shall be interchangeable. An alternate method of attachment using an internal hinge at the bottom of the door with a screw at the top of the door will be considered. Any alternate method will be subject to approval by the Commissioner or his duly authorized representative.

(i) Locking Device. Any other door locking device, other than the one outlined above in (g) and (h), must be approved by the Commissioner or his duly authorized representative.

(j) Tag. To each pole must be attached immediately below the handhole, by

mechanical means and not by adhesive, a stainless steel tag with a stamped or embossed legend which must include the pole outside diameter at the base, the overall length, and the gauge; i.e., 12.5" X 34'-6" X 3 gauge.

(k) Structural Requirements. The mast shall be manufactured in accordance with AASTHO's 1994 version of the "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals". The shaft and base assembly must be designed to meet AASTHO's 1994 criteria for 80 MPH wind loading with a 30% gust factor. The poles shall be designed appropriately for Chicago applications for both street lighting and traffic signal applications, including signal mast arms.

TOP

5. (a) Design. The mast top 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 filet, the skirt must enclose the top 7/8" inches of the mast. 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 top securely in place atop the mast. The design of the top shall be similar to the one shown on Drawing #11420A.

(b) Material. The top must be 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. Non-metallic tops may be substituted if approved by the Commissioner.

(c) Finish. Tops shall be painted as herein specified.

HARDWARE

6. All the hardware necessary to complete the assembly of the pole shall be furnished. All hardware will be as specified elsewhere in these specifications. Hardware not specified elsewhere must be stainless steel meeting the requirements of ASTM A193, or equal corrosion-resistant non-seizing metal, or a non-metallic material subject to approval by the Commissioner.

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 pole.

(b) Testing. Welds shall be inspected for penetration and soundness of the welds by the magnetic particle inspection method or by radiography. Acceptance or rejection will be governed by the same conditions as in Section 9. If the magnetic inspection process is to be used, the dry method with the direct current must 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 shall be washed with an alkaline detergent to remove any oils or grease.

(b) Metal Cleaning. All exterior metal surfaces shall 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-SP10. Included in this process will be the interior base section of the mast to a minimum height of twelve (12) inches.

(c) Chemical Pretreatment. The cleaned metal surfaces shall then be treated with a hot, pressurized iron phosphate wash and shall be dried by convection heat.

(d) Primer Coat. All exterior surfaces are to be coated with corrosion-inhibiting zinc-rich aromatic urethane conforming to SSPC Paint 20, Type II. Dry film thickness shall be a minimum of 2.5 mils (.0025”). The aromatic urethane shall consist of a zinc dust content not less than 83% by weight in dried film. The coating shall be airless-spray applied and moisture cured.

(e) Finish Coat. All exterior surfaces are to be subsequently coated with aliphatic acrylic polyurethane paint, conforming to SSPC-36, to a minimum dry film thickness of 3.0 mils (.003”). The coating shall be airless-spray applied and cured in a gas-fired convection 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 5% NaCl (by weight) solution at 95°F and 95% relative humidity without blistering. Before testing, 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 be not less than 5.5 mils.

(i) Color. Color must be gloss black unless otherwise noted in the order. A color sample must be submitted for approval prior to fabrication.

(j) Alternate Methods. Alternate painting 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.

MAST TEST

9. (a) General. All completed masts shall be available for testing for maximum deflection and set. The masts shall meet the structural requirements of Section 4(k). Unless specifically authorized in writing, all tests shall 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 Commissioner before the masts are shipped.

(b) Lot. Tests for welds, deflection and set of the mast and of the mast arm supports shall be made upon three (3) masts of the first fifty (50) in every order. An additional one (1) mast shall be tested for each additional fifty (50) masts in the order. The selection of masts for testing shall be random from the entire completed lot. If any of the masts in any lot fail to meet the test, an additional three (3) masts of the same lot must be tested. If any of these masts fail to meet the test requirements, the entire lot will be subject to rejection, except that the manufacturer may subject each mast in the lot to the test, and those which fulfill the requirement will be accepted. After testing, each base weld must be inspected by the magnetic particle method to determine that the welds have not been affected.

(c) Mast Requirements. With base rigidly anchored, a test load as indicated in Table A 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 mast and in the same vertical plane. The deflection must not be greater than that indicated in Table A. Within one (1) minute after the test load is released, measurement must be made of the set taken by the mast. This set must not be greater than that indicated in Table A. 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 ±5%. No measurable set must be noted within one (1) minute after test load is released.

(d) Mast Arm Support (simplex) Requirements. With an appropriate mast arm firmly attached to the mast, a test load of 300 pounds must be applied to the

mast arm as a side pull at a point seven (7) feet from the mast. After the test, the mast arm support welds on the mast must be tested by the magnetic particle method to determine that they have not been affected.

PACKAGING

10. (a) General. The poles must be shipped in twelve (12) pole bundles. Each pole must be individually wrapped so that the pole can be bundled for shipping and unbundled for delivery to the City without damaging the pole or its finish.

(b) Bundles. The bundles shall consist of twelve (12) poles 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 poles 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 forklift truck or crane and the bundles must be shipped on a flat bed truck to facilitate unloading. Each pole wrapping must be clearly labeled indicating the pole size, i.e. 34'6", 7 GAUGE, STEEL POLE, 15" B.C.

(c) Hardware. The bolt covers and their attachment devices must be shipped with each bundle and packaged in twelve (12) sets of four (4) each. The package must be labeled and 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. Pole caps must be attached at the manufacturer's facilities or be packed separately in a manner similar to the bolt covers, and the same payment conditions will prevail. Cracked, broken or chipped parts will be considered as an incomplete delivery as regards payment.

TABLE A

POLE	GAUGE	BOLT CIRCLE	ANCHOR ROD	BASE PLATE	TEST LOAD	MAX. DEF	MAX. SET	DRAWING
7.67"x12.5"x34'6"	3	16.5"	1.5"	1.75"	3200#	22"	2.5"	827
6.17"x11"x34'6"	3	17.25"	1.25"	1.5"	2500#	26"	2.5"	824
5.17"x10.0"x34'6"	3	15.0"	1.25"	1.5"	2000#	30"	2.5"	808
5.17"x10.0"x34'6"	7	15.0"	1.25"	1.5"	1500#	30"	2.5"	808
3.95"x8.5"x32'6"	3	11.5"	1.25"	1.5"	1500#	33"	2.5"	763
3.95"x8.5"x32'6"	7	11.5"	1.0"	1.25"	1200#	33"	2.5"	762
3.87"x8.0"x29'6"	3	10.0"	1.0"	1.5"	1500#	28"	1.0"	657
3.87"x8.0"x29'6"	7	10.0"	1.0"	1.25"	1200#	28"	1.0"	656
4.15"x8.0"x27'6"	3	10.0"	1.0"	1.5"	1500#	23"	1.0"	655
4.15"x8.0"x27'6"	7	10.0"	1.0"	1.25	1200#	23"	1.0"	654
4.20"x7.0"x20'0"	3	10.0"	1.0"	1.0"	1500#	13"	1.0"	653
3.70"x6.5"x20'0"	11	10.0"	1.0"	1.0"	800#	14"	1.0"	652

ELECTRICAL SPECIFICATION 1452
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED MARCH 19, 2014

POLE: ANCHOR BASE, ALUMINUM, TAPERED TUBULAR SHAFT

SUBJECT

1. This specification states the requirements for tapered, tubular, aluminum anchor base poles. They will support street light luminaires mounted on either truss type arms or davit style arms. The poles will be served by underground cables.

GENERAL

2. (a) Specifications. The poles shall conform in detail to the requirements herein stated, and to the requirements of the following organizations as cited herein:

Aluminum Association (AA)
American Association of State Highway and Transportation Officials (AASTHO)
American National Standards Institute (ANSI)
American Society for Testing and Materials (ASTM)
American Welding Society (AWS)
Society for Protective Coatings (SSPC)

(b) Acceptance. Poles not conforming to this specification will not be accepted. The Commissioner will be the sole judge in determining if the poles meet this specification.

(c) Bidders Drawings. Bidders must submit with their bids detailed scale drawings of the mast 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 must also be submitted in electronic format, in the latest version of either MicroStation or AutoCAD, if so requested by the City.

(d) Standard 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 completely assembled anchor-base pole of the manufacture intended to be furnished, must be submitted for review by the Commissioner within fifteen (15) business days after receipt of notice.

(f) Warranty. The manufacturer shall warrant the performance and construction of the light poles 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 light poles have been delivered. This will be interpreted particularly to mean structural or mechanical failure of any element or weld, or any faults in the anodized surfaces. 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. The Commissioner's decision will be final.

STANDARDS

3. (a) Assembly. Each anchor base pole shall consist of an aluminum mast with handhole entry, aluminum hinged entry door, grounding nut, mast base plate, top cap for non-davit masts, bolt covers, and all necessary hardware required for complete assembly of these parts, ready for assembly, without special tools.

(b) Interchangeability. Members of each pole 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 pole.

(c) Design. Each pole type must conform in design and dimensions to the pertinent drawing(s) listed in Table A.

MASTS

4. (a) Mast Size. The outside diameters of the mast of each pole type shall be as listed in Table A. The mast taper will be approximately 0.14 inches per foot.

(b) Material. The shaft must be fabricated from one length of 6063-T4 wrought aluminum alloy meeting the requirements of ASTM B221. After all welding operations are completed, the mast must be brought to a T6 temper having minimum physical characteristics of ASTM B221. The wall thickness of the shaft and the diameter of the shaft shall be as listed in Table A and as shown on the appropriate standard drawing. Material certification

shall be provided from the tube manufacturer.

(c) Fabrication. The mast must be fabricated with no longitudinal or lateral welds in the tube. The completed masts must have smooth external surfaces free from protuberances, dents, cracks or other imperfections marring their appearance. Each mast must be straight and centered on its longitudinal axis.

(d) Base. The mast base must be a permanent mold aluminum casting conforming to the requirements for aluminum alloy 356-T6 of ASTM B-108 or ASTM B-26. The base shall be similar in shape and dimensions to that shown on the appropriate standard drawing for the specific mast. The base shall consist of a collar, flange, and any other members necessary to provide strength and reduce the concentration of anticipated stresses. The shaft must extend into the base as shown on the appropriate standard drawing and be circumferentially welded to the base casting at the top outer surface and the lower inner surface of the base. Bases must be attached to the mast so that the bearing surface of the base is at right angles to the longitudinal axis of the mast.

Non-metallic removable bolt covers which completely cover the anchor bolts and nuts must be provided. The covers must be attached with stainless steel screws or another type of non-seizing fastener, as approved by the Commissioner. The covers must enclose the anchor bolts and be secured in an approved manner.

All anchor rod openings for each pole type must have a width as listed in Table A. Each opening must be sized to have a circumferential slot length equal to 15^{o} of the circumference.

(e) Cable Entry for Conventional Poles. An opening of approximately one and one quarter inches (1-1/4") in diameter, rimmed with a rubber or nylon grommet, must be furnished and installed at the point on the shaft where the clamp on the upper member of the mast arm bracket meets the pole. Certain masts may require two cable entries, depending on the order. There will be no extra compensation for the extra cable entry. This cable entry requirement does not apply to pole masts designed for davit style arms. This requirement does apply to conventional poles (Drawings 890 and 938).

(f) Option: Side Mount for Luminaire. If requested, the pole mast will be prepared for the mounting of a sidewalk-side luminaire. An opening of approximately one and one-quarter inches (1-1/4”) in diameter, rimmed with a rubber or nylon grommet, must be furnished and installed at the proper height, as indicated on the appropriate standard drawing, or as directed in the order. In addition, two (2) holes must be drilled to accept

two (2) rivnuts for mounting a City back plate for a mid-mount luminaire. All three (3) holes must be properly spaced and aligned to accept the City standard back plate for the appropriate mid-mount luminaire. The rivnuts (3/8-16) must be inserted in the pole. The holes must be properly aligned with the handhole as indicated on the standard drawings.

(g) Top of Shaft for Davit Arm. The top one foot of the mast shall be formed as shown on the appropriate standard drawing. An adapter ring may be provided if required. Two sets of holes 9/16 inches in diameter must be drilled through the mast to accommodate two bolts to attach a davit arm. The lower set (two holes) must be in line with the mast arm. The other set must be 90° apart from the other. These requirements apply to pole masts designed for davit style arms.

(h) Provision for Ground. A tapped hole must be provided on an extension or offset, centered on the handhole door frame's interior vertical surface, to accept a 1/2"-13 bolt for a ground connection.

(i) Entry. A vertical doorframe for reinforcing a door opening which provides access to the interior of the mast must be welded on the inside of the pole and be centered approximately 18 inches above the bottom of the base. The doorframe must be formed and welded of aluminum alloy 6063-T6 with a cross-section to adequately reinforce the opening of the mast. The doorframe must be as indicated on the appropriate standard drawing. The actual door opening must be sized to perfectly match the door size. For all arterial poles and for all conventional poles, the vertical centerline of the entry must be at a right angle clockwise to the vertical centerline of the mast arm. For the residential davit poles, the vertical centerline of the entry must be in-line with the vertical centerline of the mast arm. An internal flange must be welded to the inside of the pole at the bottom of the door opening. This flange will be drilled to accept a bolt. The bolt will be used to attach a hinged door to the pole. An aluminum tab must be welded to the inside upper portion of the door opening. A hole must be drilled into the tab that will accept a 1/4 inch screw. The hole must be centered horizontally in the door opening and must be centered 3/8 of an inch down from the uppermost portion of the door opening. A steel spring clip must be mounted to the tab. The clip must be made to accept a 1/4"-20 machine screw.

(j) Door. The removable door must be formed of the same aluminum as the pole. The door must fit the pole opening within a tolerance of 1/8 of an inch. The door must be flush with the pole surface in the closed position and appear as part of the original mast. The door must be attached to an internal hinge which will allow the door to open out and down. The hinge must be bolted to a flange on the inside of the pole at the bottom of the door opening, so that the door and hinge may be un-bolted and replaced if need be. The door opening must be sized according to the appropriate standard

drawing. A hole must be drilled in the top of the door in alignment with the hole on the mast. A 1/4"-20 Allen head button machine screw must be provided to fasten the door to the doorframe. The screw must have a stainless steel core with a nylon threaded body. Other types of non-seizing fasteners may be considered. All doors of the same size must be interchangeable. The door and attachment method will be subject to approval by the Commissioner or his duly authorized representative.

(k) Tag. To each pole must be attached immediately below the handhole, by mechanical means and not by adhesive, a stainless steel tag with a stamped or embossed legend which must include the pole outside diameter at the base, the overall length, and the wall thickness.

(l) Structural Requirements. The mast shall be manufactured in accordance with AASTHO's 1994 version of the "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals". The shaft and base assembly must be designed to meet AASTHO's 1994 criteria for 80 MPH wind loading with a 30% gust factor. The poles shall be designed appropriately for Chicago street lighting applications, including mast arm and luminaires. Thirty - foot davit poles and thirty- foot conventional poles for arterial streets must also allow for banner and flower basket attachments. The pole manufacturer must provide load calculations that verify that the poles are designed properly.

TOP CAP FOR NON-DAVIT POLES

5. The top cap shall be aluminum alloy. It must have smooth surfaces, neat edges and corners and be free from fins, holes, or other casting flaws. Three stainless steel set screws not less than 3/8 inches long must be equally spaced in tapped holes around the skirt to securely hold the top in place.

VIBRATION DAMPER

6. Each pole shaft will have an internal vibration damper, if requested, located at a position as shown on the appropriate standard drawing. The vibration damper must be welded or bolted to the inside of the pole shaft. If the standard drawing does not show a vibration damper none should be provided. The design of the vibration damper is subject to approval by the Commissioner or his representative.

HARDWARE

7. All the hardware necessary to complete the assembly of the pole must be furnished. All hardware will be as specified elsewhere in these specifications. Hardware not specified elsewhere must be stainless steel, or equal corrosion-resistant non-seizing metal, or a non-metallic material subject to approval by the Commissioner.

WELDING

8. (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. 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 pole.

(b) Testing. All welds of five percent (5%) of the poles in every lot must be inspected for penetration and soundness of the welds by radiography, or by a penetrant method. Acceptance or rejection will be governed by the same conditions as in the TESTING Section.

(c) Certifications. Welders must have proper certification for the welding operations required. Welding by non-certified personnel will not be allowed. Certifications must be available upon request.

FINISH

9. (a) General. All completed masts shall have a brushed satin natural finish or an anodized finish, as required by the project or in the purchase order.

(b) A satin aluminum finish requires that each mast be rotary sand finished. The satin finish shall be accomplished by using 40-50 grit belts to remove taper marks and scratches. A minimum of one pass with a 120 grit belt over the entire shaft is required to provide a uniform appearance.

(c) An anodized finish will be either matte black or semi-gloss black. A color sample must be submitted for approval before any factory production. The anodizing process must include cleaning, etching, anodizing, and sealing the mast. The etching process must meet the requirements of AA-C22. The anodizing process must meet the requirements of AA-A42. The contractor must submit his anodizing process for approval before any factory production.

MAST TEST

10. (a) General. All completed masts shall be available for testing for maximum deflection and set. The masts must meet the structural requirements of Section 4(l). Unless specifically authorized in writing, all tests must be made by the manufacturer. A record of every test must be made and a certified copy of the test record must be submitted to the Electrical Section of the Division of Engineering before the masts are shipped.

(b) Lot. Tests for deflection of the mast must be made upon five (5%) percent of all the masts in every lot (two (2) min.). The selection of masts for testing must be random from the entire completed lot. If any of the masts in any lot fail to meet the test, an additional three (3%) percent of the masts of the same lot must be tested (two (2) min.). If any of these masts fail to meet the test requirements, the entire lot will be subject to rejection, except that the manufacturer may subject each mast in the lot to the test, and those which fulfill the requirement will be accepted. After testing, each base weld must be inspected by radiography or the penetrant method to determine that the welds have not been affected. After testing, no permanent set should be visible or apparent. The mast should appear straight.

(c) Mast Requirements. With base rigidly anchored, a test load of 500 pounds must be applied at a point approximately eighteen inches (18") from the free end. The load must be applied at right angles to the center line of the mast and in the same vertical plane. With no failure of any component part, the deflection must not be greater than 7.5% of the pole height. After removal of the load, 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 ±5%.

PACKAGING

11. (a) General. The poles must be shipped in bundles. Each pole or bundle shall be wrapped so that the poles can be handled and stored without damage to the surfaces.

(b) Bundles. The poles in each bundle must be 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. Any bundles, in which either poles 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.

(c) Hardware. The bolt covers and their attachment devices must be shipped with each bundle. The package must be labeled and 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. Pole caps must be attached at the manufacturer's facilities, or be packed separately in a manner similar to the bolt covers, and the same payment conditions will prevail. Cracked, broken or chipped parts will be considered as an incomplete delivery as regards payment.

TABLE A

POLE	THICKNESS	BOLT CIRCLE	ANCHOR ROD	BASE PLATE	MAX. DEFL	DRAWING
7"x4.5"x12'-5"	.156"	10"	1.0"	0.75"	11"	940
7"x4.5"x20'-0"	.156"	10"	1.0"	0.75"	18"	890
8”x4.5”x27’	.312	11.5”	1.0”	0.75”	26”	975
10"x6"x24'-5"	.312"	15"	1.25"	1.25"	22"	941
10"x6"x27'-10.5"	.312"	15"	1.25"	1.25"	25"	938
10”x6”x29’-4.625”	.312”	15”	1.25”	1.25”	27”	971
10”x6”x34’-4.625”	.312”	15”	1.25”	1.25”	31”	972

ELECTRICAL SPECIFICATION 1454
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED SEPTEMBER 25, 2020

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 requirements of the following organizations cited herein:

American Association of State Highway and Transportation Officials (AASTHO)
American National Standards Institute (ANSI)
American Society for Testing and Materials (ASTM)
American Welding Society (AWS)
Society for Protective Coatings (SSPC)

(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 dgn format, if 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 filet, 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 corrosion-inhibiting zinc-rich aromatic urethane conforming to SSPC Paint 20, Type II. Dry film thickness shall be a minimum of 2.5 mils (.0025”). The aromatic urethane shall consist of a zinc dust content not less than 83% by weight in dried film. The coating shall be airless-spray applied and moisture cured.

(e) Finish Coat. All exterior surfaces are to be subsequently coated with aliphatic acrylic polyurethane paint, conforming to SSPC-36, to a minimum dry film thickness of 3.0 mils (.003”). The coating shall be airless-spray applied and cured in a gas-fired convection 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 5% Na Cl (by weight) solution at 95°F and 95% relative humidity without blistering. Before testing, 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 ±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.

ELECTRICAL SPECIFICATION 1457
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED AUGUST 3, 2006

CABLE: SERVICE ENTRANCE, THREE INSULATED CONDUCTORS IN ONE OVERALL JACKET, 600 VOLT

SUBJECT

1. This specification states the requirements for a three conductor (two power conductors and one neutral conductor) Ethylene Propylene Rubber (EPR) insulated, chlorosulfonated polyethylene (CSPE) or polyvinyl chloride (PVC) jacketed cable for installation on Commonwealth Edison service poles for the purpose of providing secondary power feeds from Commonwealth Edison to a City disconnect mounted on the pole for street lighting or traffic signal circuits.

GENERAL

2. (a) Specifications. The cable shall conform in detail to the requirements herein stated, and to the applicable portions of the specifications and methods of test of the following agencies:

(1) ICEA Specification S-95-658
(2) IEEE Standard 383
(3) ASTM Standard E-662-79
(4) ASTM Standard D-470-81
(5) UL 44
(6) UL 854

(b) Acceptance. Cable not conforming to this specification will not be accepted.

(c) Sample. A three (3) foot sample of the cable intended to be provided under this contract must be submitted to the Engineer of Electricity within fifteen (15) business days after receipt of such a request from the Chief Procurement Officer.

(d) Warranty. The manufacturer shall warranty the cable to be first class material throughout. If the cable is installed within one year of the date of shipment, the manufacturer must replace any cable failing during normal and proper use within two years of installation. The cable length to be replaced will be the entire unspliced length where the fault has been located. The Commissioner will be the sole judge in determining if a cable has failed

and should be replaced. All replacements under this warranty must be made free of charge F.O.B. delivery point of the original contract

CABLE

3. (a) Construction. The cable must consist of three (3) conductors separately insulated and color coded. Suitable fillers must be used to produce essentially a round cross section in the completed cable. The insulated conductors must be cabled with a suitable left hand lay in conformance with the latest revision of ICEA S-95-658. A binder tape must be used over the cabled conductor assembly and a jacket applied overall.

(b) Sealing. The ends of each length of cable shall be sealed against the entrance of moisture.

(c) Marking. The color of the neutral conductor must be white; that of the phase conductors must be black and red, respectively. The jacket must be black.

(d) Each conductor shall consist of a round copper wire with a tight fitting, free stripping, concentric layer of Ethylene Propylene insulation. The cable must be rated for continuous duty at 90°C operating temperature, wet or dry, 130°C emergency overload temperature and 250°C short circuit temperature.

CONDUCTOR

4. (a) Material. The conductor shall either be soft or annealed round copper wire, tin coated.

(b) Specifications. The conductor must meet the requirements of ASTM B3, and B8 for stranded Class B copper.

(c) Size. The conductor size shall be as stated in the proposal or on the plans.

INSULATION

5. (a) Type. The insulation must be Ethylene Propylene 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 30 mils (.030") for #14 AWG, 55 mils (.055") for #4 AWG, 65 mils (.065") for #2 AWG, 80 mils (.080") for #1/0 AWG, 80 mils (.080") for #2/0 AWG, and a spot thickness not less than ninety percent (90%) of the average thickness.

(c) Initial Physical Requirements:

(1) Tensile Strength, min., psi. 1200

(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:

(1) Tensile strength, min% of unaged value 75

(2) Elongation, min % of unaged value at rupture 75

(e) Mechanical Water Absorption:

(1) Gravimetric Method: After 168 hours in water at 70 ± 1°C:

Water absorption, maximum
(Mg. per sq. in) 5.0

(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. The jacket shall be either a chlorosulfonated polyethylene (CSPE) or a polyvinylchloride (PVC) compound meeting the physical and electrical requirements specified herein. CSPE must meet the environmental requirements of CFR Title 40, Part 261 for leachable lead content.

(b) Thickness. The jacket must be circular in cross-section, concentric with the insulation, must have an average thickness not less than 45 mils (.045") for #14 AWG, 80 mils (.080") for #2 and #4 AWG, and not less than 95 mils (.095") for #1/0 and #2/0 AWG, 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 shall be performed on insulation, jacket and completed cables in accordance with the applicable standards as listed in these specifications. Included in these tests will be a 70,000 BTU per hour flame test in accordance with IEEE 383. 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 Division of Engineering, will apply. All tests shall be conducted on cable produced for this order.

(b) Number of Tests. Insulation and jacket tests shall be conducted on samples taken every 5,000 feet or fraction thereof of each conductor size. In no case must less than two (2) samples be taken. Approximately five percent (5%) of the cable must be tested. Where the cable fails to conform to any of the tests specified herein, 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.

(c) Test Reports. No cable may be shipped until certified copies of all factory tests have been reviewed and approved by the engineer.

PACKAGING

8. (a) Cable Marking. The cable must be identified by a permanently inscribed legend in white lettering as follows:

3/C - No. (conductor size) AWG-600V-90°C-EPR/CSPE or EPR/PVC-manufacturer's name- month/year of manufacture

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.

(b) Reels. The completed cable shall 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. 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.

(c) Footage. Each reel must contain 1,000 foot of cable for either #4 AWG or #2 AWG and 500 feet of cable for #1/0 AWG or #2/0 AWG. A tolerance limit of plus or minus ten percent (±10%) shall be adhered to.

(d) 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 and the total footage. 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 1 - THREE CONDUCTOR SERVICE ENTRANCE CABLE

Size (AWG)	Overall Diameter (mils)	No. Of Strands	Test Volts (KV)	Footage per Reel	Insulation (mils)	Jacket (mils)
4	950	7	4.5	1000	55	80
2	1100	7	4.5	1000	65	80
1/0	1400	19	5.5	500	80	95
2/0	1800	19	5.5	500	80	95

ELECTRICAL SPECIFICATION 1458
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED MARCH 4, 2014

ELECTRICAL MANHOLE FRAMES AND COVERS 24 INCH AND 30 INCH DIAMETER

SCOPE

1. This specification describes the requirements for both 24 inch and 30 inch round frames and covers. These frames and covers will be used for electrical manholes and handholes and will provide access to the interior of the manholes and handholes. The 24 inch frames and covers will be used in parkway and sidewalk areas. The 30 inch frames and covers will be used in streets and in driveways and will provide sufficient strength to withstand normal traffic conditions.

GENERAL REQUIREMENTS

2. (a) Conformance. The manhole frames and covers shall conform with every detail of 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 in which the most recently published revision will govern.

(b) Acceptance. Frames and covers not conforming to this specification will not be accepted. The Commissioner of Transportation will have the final say as to whether or not the frames and covers meet specifications.

(c) Drawings. The drawings mentioned herein are drawings of the Department of Transportation, Division of Engineering, and must be interpreted as part of these specifications.

(d) Sample. Upon request, one complete manhole frame and cover of the manufacture intended to be furnished must be submitted within fifteen (15) business days after receipt of such a request from the Chief Procurement Officer. The samples must be delivered to the Division of Electrical Operations, 2451 South Ashland Avenue, Chicago, Illinois.

(e) Warranty. The manufacturer shall warrant that the frames and covers meet the specifications and warrant the frames and covers for a period of one (1)

year from the date of delivery against defects which may occur during that period from normal and customary use. Any frame or cover which fails during this period must be replaced by the manufacturer at no cost to the City.

DESIGN

3. (a) The frames and covers shall each conform in detail to the designs shown on Drawings 872, 874 and 10927.

(b) Each frame and cover shall weigh approximately as shown on the drawings.

(c) Machining. The bearing surfaces of both the cover and the frame shall be machine finished as indicated on the drawings.

(d) Workmanship. The frames and covers must be mutually interchangeable size for size, so that each lid will fit every frame neatly without jamming and with only such clearance as the drawings indicate. In addition, 24" & 30" covers must fit existing 24" & 30" frames, as shown on drawings 872, 874 and 10927. The castings shall be neat, true to pattern and free from cracks and casting flaws. No welding of defective castings will be permitted nor must the castings be painted.

(e) Material. The frames and covers must be made of Class 30 Cast Iron described in the specifications for Gray Iron Castings of ASTM A48. No plugging of defective castings will be permitted.

TESTS

4. (a) Test bars of the metal used for the castings shall be made and tested for tensile and transverse strength in accordance with ASTM A48. The metal must be tested at the works of the manufacturer. The manufacturer must furnish a certified copy of all test data sheets to the City prior to delivery of the castings. Frames and covers shall each be considered a separate casting for determining the requirement of testing.

ELECTRICAL SPECIFICATION 1462
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED NOVEMBER 21, 2014

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. 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
d. manufacturer's name

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 Trade Size of Conduit	Inside Minimum Diameter	Outside Diameter	Wall Thickness	Length Without Coupling	Weight of Ten Unit Length w/couplings
(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 (INCHES)	Outside Diameter (INCHES)	Minimum Length (INCHES)	Minimum Weight (POUNDS)
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

ELECTRICAL SPECIFICATION 1463
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED FEBRUARY 7, 2014

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 15 business days upon receipt of such a request. It must be delivered to the Division of Electrical Operations, 2451 South Ashland Avenue, Chicago, Illinois 60608.

(d) Warranty. Bracket must have a minimum 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. The warranty will start from the date of delivery [date of acceptance for contract construction].

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 3, 4, or 5 section signal heads, 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 2, 3, and 5 signal head configurations; for use with optically programmed signal heads; and for use with illuminated 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 .5 inch 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 .75 inch wide stainless steel.

(g) Castings. Where castings are used for the brackets, they shall be smooth and free of defects.

TESTING

4. (a) General. At least 1% of the traffic signal mounting brackets in each order or contract shall be tested for rigidity and structural integrity.

(b) Re-testing. If any mounting bracket fails any portion of the test, an additional 3% of the brackets must be tested. If an additional bracket fails, the entire lot will be rejected.

(c) Tests.

1. With five 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 100 pound force must be applied for 60 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 100 pound force must be applied to the top signal head section for 60 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 10 times with an 8 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.

PACKAGING

5. (a) Packing. Each bracket shall be packed in a suitable carton so secured that the bracket and parts will not be damaged during shipment, handling or storage.

(b) Marking. Each carton containing the bracket and parts shall be clearly marked on the outside in letters not less than 3/8 inches tall with the legend: "TRAFFIC SIGNAL MONOTUBE BRACKET", the name of the manufacturer, the date of manufacture, the contract number, and the City commodity code.

ELECTRICAL SPECIFICATION 1465
DIVISION OF ENGINEERING
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 Division of Electrical Operations, 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 metallically 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.

SPECIFICATION 1467
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED JUNE 28, 2012

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 Engineering, 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. 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.

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.

ELECTRICAL SPECIFICATION 1473
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED FEBRUARY 12, 2010

POLE MOUNTED CAST ALUMINUM BOX FOR MAIN SERVICE DISCONNECT

SCOPE

1. This specification states the requirements for a pole mounted, cast aluminum box intended for outdoor use on the City=s Street Light and/or Traffic Control Systems as a main service disconnect. The box will be mounted on a Commonwealth Edison pole and will feed a separately mounted street light controller or traffic signal controller.

GENERAL

2. (a) Specification. The junction box shall conform in detail to the requirements stated herein, 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) Drawing. The drawing mentioned herein is a drawing of the Department of Transportation, Division of Engineering, and must 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 of the manufacture intended to be furnished, must be submitted within fifteen (15) business days after receipt of a request from the Chief Procurement Officer.

DESIGN

3. (a) Drawing. The junction box must conform in detail to the dimensions and requirements shown on Standard Drawing Number 893.

(b) Material. The body and door must be castings of non-heat treated aluminum silicon alloy conforming to ANSI alloy 443.0 of ASTM B26.

(c) Assembly. Each junction box must consist of the body, door, gaskets, bronze eye-head bolts, bronze wing nuts and stainless steel knurled pins furnished as described below, all completely assembled, painted and ready for installation.

(d) Body. The body must be cast as shown in Drawing Number 893. The body must be complete with all drilled and tapped holes required for the mounting of any hardware required to make the box fully functional for a service disconnect.

(e) Door. The door must be cast as in Drawing Number 893. The door must be furnished with a 1/2@ x 3/16" sponge neoprene gasket cemented in place completely around the door jam. The door must be painted prior to cementing the gasket into its groove on the door.

(f) Hardware. The hinge pins must be stainless steel. The eye-head bolts and wing nuts must be bronze.

(g) Painting. The exterior surfaces of the junction box must be properly cleaned and given one (1) coat of an approved zinc chromate primer containing a minimum of ten percent (10%) iron oxide, and one (1) coat of black enamel. The paint must be approved prior to production.

(h) Packing. Assembled junction boxes 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.

ELECTRICAL SPECIFICATION 1475
DIVISION OF ENGINEERING
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 90ºC 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 90ºC 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 ± 1ºC for 168 hours using methods of test described in ASTM-D 573:

Tensile strength, minimum percent of unaged value 85

Elongation at rupture, minimum percent of unaged value . . . .. .65

(f) Mechanicl Water Absorption:

1. Gravimetric Method. After 168 hours in water at 70± 1ºC:

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 (-) 25ºC.

(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 158º C ± 1ºC. 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 90º 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 ± 1ºC for 168 hours for LSZH or 136 ± 1ºC 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 ± 1º 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.

ELECTRICAL SPECIFICATION 1493
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED MARCH 15, 2023

TRAFFIC SIGNAL: VEHICULAR, TWELVE-INCH SINGLE FACE, SINGLE OR MULTIPLE-SECTION, POLYCARBONATE, LED ~~OR INCANDESCENT~~

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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 a 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, green arrow, red bicycle, yellow bicycle, green bicycle, white vertical bar, and white horizontal bar.

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 15 business days upon request of the Chief Procurement Officer. The sample must be delivered to the 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 Iron and Steel Institute (AISI)
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 3 years from date of delivery [date of acceptance for contract construction]. In addition, LED optical modules must carry a 7-year warranty against failure or loss of color (chromaticity) and signal brightness (luminance) below minimum acceptable ITE standard levels from date of delivery [date of acceptance for contract construction]. In the event defects or failures occur in the 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 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.

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, .125" 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 2 washers, 3 zinc plated bolts, nuts, and lock washers which lock the individual sections together. As an alternative, individual sections may be fastened together with 4 cadmium plated bolts, lock washers, and nuts.

(d) Height. The overall height of an assembled traffic signal must be 14 inches ±1 inch for a single-section signal, 42 inches ±3 inches for a three-section signal, and 70 inches ±5 inches for a five-section signal.

(e) Mounting. The traffic signal shall be designed for mounting with standard traffic signal brackets using 1.5-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 5˚ increments. A total of 72 teeth must be provided in the serrated bosses to allow the signal face to be rotated 360˚ 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 4 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 2 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 hinge lugs on the left side and 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 2 stainless steel hinge pins, drive fitted. Two 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 holes with threaded metal inserts for stainless steel machine screws to secure the visor and the lens. The inside of the door must be grooved to accommodate a one piece, air-cored ethylene propylene diene monomer (EPDM) gasket to provide a weatherproof and dust proof seal when the door is closed. The inside of the door must have 4 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 4 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, 9.25 inches 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 4 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 modules ~~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, green, and yellow polycarbonate lenses must be round with a nominal 12-inch diameter and shall conform to all requirements set forth under the heading "Traffic Signal Lenses" in the ITE standard. The red, green, and yellow arrow lenses must be round with a nominal 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 meet ITE standards. 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 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 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 82% and a protective oxide coating. 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 MODULES

(a) Light emitting diode (LED) optical modules shall consist of an integral unit containing the following components: power leads, housing, 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 module 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 module 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).

(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% of the values specified in the standard.

(e) The module indicator surface shall be constructed of ultraviolet (UV) stabilized, impact resistant polycarbonate, acrylic, or other approved material.

The surface must be anti-glare, smooth texture, and clear.

(f) Modules shall consist of LEDs uniformly distributed to present a homogeneous appearance on the indicator face 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 2 or more series strings of LEDs or in excess of 20% of LEDs are not operable.

(i) Module 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 ± 3 hertz.

(j) Surge protection: Each module 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˚F.) must be 30 watts at a minimum 90% power factor. Power consumed must not vary by more than 10% from nominal power consumption over a voltage range of 105 volts to 125 volts, and over permissible environmental ranges.

(l) Modules must be fully operable at temperature ranges of -40˚F. (-40˚C.) to +165˚ F. (+74˚C.) at up to 100% relative humidity.

(m) Modules 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 module 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) Modules shall meet applicable sections of Title 47, Sub-Part 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%.

(q) LED modules 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:

First Lead Wire:

White	Common

Second Lead Wire:

Red	Red Section
Yellow	Yellow Section
Green	Green Section
Green with Black Tracer	Green Arrow Section
Yellow with Black Tracer	Yellow Arrow Section
Red with Black Tracer	Red Arrow Section
Green with White Tracer	Green Bicycle Section
Yellow with White Tracer	Yellow Bicycle Section
Red with White Tracer	Red Bicycle Section
Any Other Colors	Bus Sections

The leads must be No. 18 AWG stranded copper wire rated at 600-volt, 105˚ C., with thermo-plastic insulation. The leads must connect to the terminal strip without being spliced. The ends of the leads must be stripped of 0.5 inches 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, or other approved section within a multiple section head.

2.6 Cable. One 11-foot 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 a neutral and one leg for each section. Both ends of each cable length must be carefully stripped of 6 inches of jacket and 1 inch 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 modules shall be tested by a nationally recognized testing laboratory (NRTL), such as Intertek (ETL division), 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 request of the Commissioner. Final inspection shall be made at point of delivery. Any signal rejected shall be removed, disposed of, and replaced by the contractor at his sole cost.

4. PACKAGING

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 3/8 inch tall with the legend: "~~TRAFFIC SIGNAL, TWELVE-INCH, POLYCARBONATE" or~~ TRAFFIC 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.

ELECTRICAL SPECIFICATION 1495
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED FEBRUARY 7, 2014

TRAFFIC SIGNAL MOUNTING BRACKET POLYCARBONATE, SIDE OF POLE

SCOPE

1. This specification states the requirements for polycarbonate brackets designed for mounting traffic and pedestrian signal heads from the side of poles.

GENERAL REQUIREMENTS

2. (a) Sample and Certified Test Reports. One complete signal bracket of the manufacture proposed to be furnished, must be submitted along with the required certified test reports, within 15 business days upon request of the Chief Procurement Officer. The sample must be delivered to the Division of Electrical Operations, 2451 South Ashland Avenue, Chicago, Illinois 60608.

(b) Standards. Equipment furnished under this specification must 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)

(c) Approval. Approval will mean approval in writing by the Commissioner or his/her duly authorized representative.

(d) Warranty. The manufacturer shall warrant the signal bracket 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 3 years from date of delivery [date of acceptance for contract construction]. In the event defects and failures

become apparent during this period, the manufacturer must replace the defective brackets 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.

MATERIAL

3. (a) The bracket must be one piece, ultra violet stabilized polycarbonate resin of the specified color, injection molded complete with integral top, bottom, and sides.

(b) The polycarbonate formulation used must provide these physical properties (Tests may be performed on separately molded specimens).

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-lb/in.	ASTM D 256
Fatigue strength (at 2.5 mm cycles)	950 PSI min.	ASTM D 671

(c) Glass. The polycarbonate may be glass impregnated to increase strength.

POSITIONING DEVICE

4. The top and bottom opening of the bracket must have integral serrated bosses that will provide positive positioning of the signal head in 5˚ increments to eliminate undesirable rotation or misalignment of the signal head between sections. A total of 72 teeth must be provided in the serrated bosses to allow the signal head to be rotated 360˚ about its axis. The teeth must be clean and sharp to provide positive positioning with the grooves of the signal head.

HARDWARE

5. The mounting brackets must be provided complete with 1 polycarbonate shim(.25 inches thick), one 1.5 inch chase nipple with rubber gasket, and 1 pinnacle cap with rubber gasket.

DIMENSIONS

6. The bracket must have nominal dimensions of 12 inches long, by 6 inches high, by 3 inches wide.

WIRING SPACE

7. The bracket must have an integral molded wireway with a minimum 1.5 inch diameter opening.

DESIGN STRENGTH

8. The bracket must be designed to support a 12 inch, single face, five-section, polycarbonate signal head.

TESTING AND DOCUMENTATION REQUIREMENTS

9. (a) Documentation. The contractor must provide certified manufacturing and testing documentation to demonstrate that the brackets being supplied meet or exceed the specification requirements.

(b) Inspection. The brackets will be subject to inspection at the request of the Commissioner. Final inspection must be made at point of delivery. Any bracket rejected must be removed, disposed of, and replaced by the contractor at his sole cost.

PACKAGING

10. (a) Each bracket must be packed in a suitable carton so secured that the bracket will not be damaged during shipment, handling, or storage.

(b) Marking. Each carton containing brackets must be clearly marked on the outside in letters not less than 3/8 inch tall with the legend: "POLYCARBONATE SIGNAL BRACKET, SIDE OF POLE" the appropriate City Commodity Code Number, the name of the manufacturer, the date of manufacture, and the pertinent contract number.

ELECTRICAL SPECIFICATION 1497
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED SEPTEMBER 25, 2006

ARTERIAL STREET LIGHTING CONTROLLER

SUBJECT

1. This specification states the requirements for an arterial street lighting controller and aluminum cabinet for use in controlling arterial street lighting circuits. The cabinet shall be mounted on top of a ballast base housing, which will be affixed to a concrete foundation.

GENERAL

2. (a) Specifications. The controller shall conform in detail to the requirements herein stated, to the Federal Standard cited by number, and to the specifications and methods of test of the American Society for Testing and Materials, cited by ASTM Designation Number, in which the most recently published revision will govern. Cabinets must meet or exceed the requirements of a NEMA rating 3R and must be U.L. listed.

(b) Acceptance. Controllers and cabinets not conforming to this specification will not be accepted.

(c) Drawings. The drawings mentioned herein are drawings of the Department of Transportation, Division of Engineering, and must be interpreted as part of these specifications cooperating to state necessary requirements.

(d) Sample. One complete controller in cabinet of the manufacture intended to be furnished must be submitted upon request of the Chief Procurement Officer within fifteen (15) business days after receipt of such a request. The sample must be delivered to the attention of the Division of Electrical Operations, 2451 South Ashland Avenue, Chicago, Illinois 60608.

(e) Warranty. The manufacturer shall warranty the controller and cabinet against flaws in material or workmanship for a period of two (2) years from the date of delivery. Any controller or cabinet developing flaws within this period must be replaced by the manufacturer, including shipment, at no cost to the City.

DESIGN

3. (a) Drawings. The control cabinet must conform in detail to requirements shown on Drawing 876 for a 100 Amp application and to Drawing 880 for a 200 Amp application.

(b) Material. The cabinet and the door assembly must be constructed of 5052-H32 sheet aluminum alloy, with a minimum thickness of .125 inches. The base plate must be sheet aluminum of .250 inch thickness. All electrical components and wiring must be as shown on the appropriate drawings.

(c) Dimensions. The overall outside dimensions of the 100 amp control cabinet must be 36 inches in height by 20 inches in width by 15 inches in depth. The overall outside dimensions of the 200 amp control cabinet must be 41 inches in height by 25 inches in width by 16 inches in depth. Cabinets must have sloped tops to shed water.

CABINET REQUIREMENTS

4. (a) Cabinet. The cabinet must be sized as shown on either Drawing 876 or Drawing 880, depending on the controller amp rating. The cabinet door opening must be double flanged on all four (4) sides. A door restraint must be provided to prevent the door from moving in windy conditions.

(b) Door. The door size must be a minimum of 80% of the front surface area. The door must be hinged on the right side when facing the cabinet. The door must have a gasket that meets the requirements found in U.L.508 Table 21.1. The gasket must form a weather-tight seal between the cabinet and the door. The door, when closed, must be flush with the cabinet.

(c) Hinges. Hinges must be continuous and bolted to the cabinet and door with 1/4-20 stainless steel carriage bolts and nylock nuts. Hinges must be made of .093 inch thick aluminum. The hinge leaves must not be exposed externally when the door is closed. Only the hinge knuckles must be visible upon closing the door. The hinge pin must be .250 inch diameter stainless steel and must be capped top and bottom by weld to render it tamper-proof.

(d) Latching. The latching mechanism must be a three-point draw roller type. The pushrods must be aluminum. The rollers must be nylon with a minimum diameter of .875 inches. The center catch must be .187 inch aluminum, minimum.

(e) Handle. The handle must be stainless steel with a .750 inch diameter shank. The handle must have provision for a padlock. The lock must be keyed dead bolt #200725 or equivalent. Two (2) keys must be provided for each cabinet.

(f) Ventilation. Louvered vents must be provided in the door. Louvers must satisfy the NEMA rod entry test for 3R enclosures. A removable filter must cover the louvers from inside the door. The filter must be held firmly in place with top and bottom brackets and a springloaded clamp. Exhaust air must be vented out between the top of the cabinet and the door. The exhaust area must be screened with openings of .12 inch by 1.0 inch.

(g) Equipment Mounts. The cabinet must be equipped with two (2) adjustable "C" channels on both side walls and on the back wall. The internal dimensions of the channels must be 1.075 inches high by .625 inches wide. All mounting hardware must be furnished.

(h) Workmanship. All control cabinets must be free of flaws, and must have neat, smooth exterior surfaces. All holes must be accurately located and drilled. All welds must be neatly formed and free of cracks, blow holes, or other irregularities. All inside and outside edges must be free of burrs.

(i) Painting. The cabinet, door and other parts must be treated by an iron phosphate conversion technique. After which, all the parts must be baked dry. A polyester powder coat must then be applied. The inside of the cabinet and door must be white. The outside of the cabinet and door must be green meeting No. 14110 of Federal standard Number 595, or a gloss black, or another color as specified. A paint chip must be provided upon request. If the cabinet is not required to be painted, the cabinet will be left in a natural aluminum condition.

PANEL

5. (a) The panel must be composed of phenolic plastic ½ inch in thickness, or an approved equal. It must be securely bolted to the cabinet using stainless steel hardware.

(b) The panel will be sized, cut, and drilled as shown on the appropriate standard drawing. For a 100 amp – 2 pole controller, the panel must comply with Drawing 883. For a 200 amp – 2 pole controller, the panel must comply with Drawing 884. For a 100 amp – 3 pole controller, the panel must comply with Drawing 887. For a 200 amp – 3 pole controller, the panel must comply with Drawing 886. If alternate components are proposed, the panels must be sized accordingly.

ELECTRICAL COMPONENTS

6. (a) All components will be as indicated on the appropriate drawing, or will be approved equals. Circuit breakers must have thermal magnetic trips. Each breaker must be enclosed in a hard insulated housing. All breakers must be UL listed. The photo-cell relay, if required, must meet City specifications.

(b) Wiring will be as indicated on the appropriate drawing. All wire will have stranded copper conductors, unless indicated otherwise. All wires must be insulated with an approved 125º Centigrade insulation.

(c) For a 3-wire, 1-phase, 240 volt ComEd input, components and wiring will be as indicated on Standard Drawing 862 (for either 100 amp or 200 amp service). For a 2-wire, 240 volt ComEd input, components and wiring will be as indicated on Standard Drawing 863 (for 100 amp service only). For a 4-wire, 3-phase, 120/208 volt ComEd input, components and wiring will be as indicated on Standard Drawing 864 (for either 100 amp or 200 amp service).

ELECTRICAL SPECIFICATION 1504
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED MARCH 6, 2014

CHICAGO 2000 PEDESTRIAN POLE: 12'-0", 11 GAUGE FLUTED, TAPERED STEEL FOR 15" BOLT CIRCLE

SUBJECT

1. This specification states the requirements for an Anchor Base Chicago 2000 Pedestrian Pole. This pole will support a tenon mounted luminaire. A split pedestal base described under a different material specification, will be provided to cover the bottom nominal 31" of the pole. This pole will be served by underground cables.

SUBMITTAL INFORMATION REQUIRED

2. (a) Manufacturer's Shop Drawings. Scaled manufacturer's shop drawings showing actual light pole dimensions, details, and welds. Shop drawings must be original engineering drawings created by the manufacturer; photocopied or scanned copies of the Standard Drawings will not be accepted, and will be rejected as an incomplete submittal. These drawings must also be submitted in electronic format in Microstation 95, if requested; failure to provide drawings in this format will be cause for rejecting the submittal.

Dimensions must include but will not be limited to: mast height, width, taper, and fluting; base plate length, width, thickness, and bolt circle; handhold length, width, plan location, and height above base plate; component attachment plan locations and heights above baseplate including luminaire tenon.

Details must include scaled and dimensioned plan views, front elevations, side elevations, and section views as required for components including but not limited to: handhole and luminaire tenon.

Welds must include but will not be limited to locations, sizes, and types of welds in accordance with the WELDING Section of this Specification.

(b) Manufacturer's catalog cut sheets showing light pole designation(s), characteristics, and catalog number(s).

(c) Manufacturer's specifications including fabricating materials and processes.

(d) Manufacturer's written installation instructions and maintenance manuals including recommendations and/or procedures for storage, assembly, orientation, installation, component access and wiring, and numeric tolerances for torquing the foundation anchor bolts to the light pole base plate.

(e) Sample. If requested by the Chief Procurement Officer, one completely assembled anchor-base pole with integral components, of the manufacture intended to be furnished, will be submitted within fifteen (15) business days from receipt of notice.

(f) Warranty. The manufacturer must warrant the performance and construction of these light poles to meet the requirements of this specification and must warrant all parts, components, and appurtenances against defects due to design, workmanship, or material developing within a period of five years after the light poles have been delivered. This will be interpreted particularly to mean structural or mechanical failure of any component, failure of any weld, or failure of any portion of the painting system. The warranty must be furnished in writing guaranteeing replacement, including shipment, free of charge to this Contract and to the City, of any light pole assembly, or any component parts thereof, which, as determined by the Commissioner, would develop aforesaid failures. The warranty must accompany submittal information. Any light pole or part thereof not performing as required or developing defects within this period, must be replaced by the manufacturer at no cost 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. Any cost for the warranty as specified will be incidental to this contract.

GENERAL

3. (a) Products. Light poles and component equipment must be the products of established manufacturers, and must be suitable for the service required. Light pole or component equipment items which are proposed as similar or identical must be the products of a single manufacturer. Masts will be manufactured by Union Metal Corporation, Valmont Industries Incorporated, or an approved equal.

(b) Specifications. The poles must conform in detail to the requirements herein stated, and to the requirements of the following organizations as cited herein:

American Association of State Highway and Transportation Officials (AASTHO)
American Society for Testing and Materials (ASTM)

American Welding Society (AWS)
Society for Protective Coatings (SSPC)

(c) Drawings. The drawings mentioned herein are drawings of the Department of Transportation being an integral part of this specification cooperating to state the necessary requirements.

(d) Design. The pole must conform in design and dimensions to Standard Drawing 928.

(e) Approval. Whenever "approval" and "approved" are used in this specification they will mean a written approval by the Commissioner to be secured prior to proceeding with manufacture of these light poles.

(f) Commissioner's Review. The Commissioner will be the sole judge in determining if the submitted light poles are in compliance with this specification. The Commissioner's decision will be final

MAST

4. (a) Mast Size. The mast size will be nominally 12'-0" as shown on Standard Drawing 928. The mast diameter at the bottom must be 6.61".

(b) Mast Design. The mast must be tapered at 0.14" per foot. The 12'-0" long mast must be of monotube construction and must be rolled on a mandrel to provide a 16-flute pattern. The flutes must be neat, true to pattern, and free from cracks and flaws. Each mast must be straight and centered on its' longitudinal axis. The mast must utilize a single longitudinal weld, 70% minimum penetration, in accordance with the WELDING Section of this Specification. There must be no lateral welds in the mast other than at the base plate and at the luminaire tenon, unless noted otherwise on the Contract Drawings.

(c) Material. The mast must be 11 gauge carbon steel in accordance with ASTM A595, Grade A.

(d) Mast Base. The mast base must be a 1" thick steel plate of low alloy, high strength steel conforming to ASTM A 595, grade C, ASTM A 588 or ASTM A 606.

1. The base must be attached to the mast so that the bearing surface of the base is at right angles to the longitudinal axis of the mast. The vertical center line of the seam must be positioned 135˚ counter-clockwise from the vertical center line of the handhold door frame.

2. The mast must be inserted into the base to a maximum depth which will still allow for an adequate weld to be made between the bottom of the mast and the plate. A circumferential weld must be made between the mast and the base at both the top and underside of the plate.

3. The base plate must have four (4) 1 1/2" wide slots to accommodate 1 1/4" diameter anchor bolts. The slots must be 3 inches long along the circumference. The mast must provide for mounting on a 15" bolt circle using 1 1/4" anchor bolts, nuts and washers provided by others. Any special hardware required to facilitate installation must be provided under this contract.

(e) Provision for Ground. A 1/2" - 13 square nut must be welded to the inside of the mast on the handhole entry frame for a ground connection.

(f) Entry. A vertical doorframe carrying a removable door providing access to the interior of the mast must be welded into a close fitting opening centered approximately 16" above the bottom of the base. The doorframe must be formed and welded of steel with cross section not less than 1-1/2" wide by 1/4" inch thick so as to adequately reinforce the opening of the mast. The internal horizontal clearance of the doorframe must be 4"; its internal vertical height must be 8". Its upper and lower ends must be semi-circular meeting its straight sides tangentially. The frame must have two welded tabs; one at the top and one at the bottom of the door frame. The top hole must be located 13/16 of an inch from the top of the opening. The bottom hole must be located 13/16 of an inch from the bottom of the opening.These tabs must be drilled to accept a 1/4 inch screw. Stainless steel spring clips must be mounted to the tabs. These clips must be made to accept 1/4" -20 machine screws. The entry must in all respects be identical to handhole openings on poles that have already been installed and accepted by the City.

(g) Door. The removable door must be formed of sheet steel approximately 1/8" thick. It must fit the doorframe closely and be dished so that it will stay in proper position even if its locking screws may be slightly loosened. The door must be drilled top and bottom to accept the 1/4" - 20 hex head stainless steel screws which will fasten the door to the doorframe. All doors must be interchangeable. Doors must fit pole handholes of like poles that have already been installed and accepted by the City. Alternate methods may be subject to approval by the Commissioner or his fully authorized representative.

(h) Tag. A stainless steel tag must be attached to each pole immediately below the handhole by mechanical means and not by adhesive. The stainless steel tag must have an embossed legend which must include the pole outside diameter at the base, the overall length, and the gauge; i.e. 6.375" x 12'-0" - 11 gauge.

(i) Interchangeability. Each member including the handhole doors in the pole and all component equipment must be mutually interchangeable for assembly, so that no work will be required to make any member fit properly in the place of any other similar member of any other similar pole.

(j) Tenon. A tenon must be provided at the top of the pole for attachment of a luminaire. The tenon diameter must be a 3" O.D. I.P.S. pipe equivalent and must be sufficiently long to ensure positive, structurally sound mating between the mast and the attached device. In no case will the tenon be more than 3" long. The tenon must be factory assembled to the mast. The finished mast must give the appearance of a single, homogeneous mast and the entire assembly must be structurally sound so that with the weight of a luminaire, the mast will not twist, rack, vibrate or otherwise deform when subjected to the severe vibrations of wind loading, passing elevated trains or heavily loaded vehicles.

(k) Luminaire Mounting Height. The luminaire mounting height indicates the height necessary to provide a distance of 14.0 feet from the top of the light pole foundation to the light source center of the luminaire.

(l) Structural Requirements. The mast shall be manufactured in accordance with AASTHO's 1994 version of the "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals". The shaft must be designed for 80 MPH wind loading with a 30% gust factor.

HARDWARE

5. All the hardware necessary to complete the assembly of the pole must be furnished. All hardware will be stainless steel or equal corrosion-resistant metal, or as noted in these specifications, subject to approval.

WELDING

6. (a) General. Where welds are required and approved, each welded joint must be thoroughly cleaned of flux and spatter, and must be made in conformity with the standards of the American Welding Society. Each bidder must submit with his proposal a drawing showing the sizes and types of welds, in conformity with the proper interpretation of the standard welding symbols of the American Welding Society. The bidder's proposal must state the type of electrode and must describe the welding methods proposed for use in fabricating the pole.

(b) Certifications. Welders must have proper certification for the welding operations required. Welding by non-certified personnel will not be allowed.

Certifications for welding personnel must be included with the submittal information package for review.

(c) Testing. All welds of 5% of the poles 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 will be governed by the same conditions as in the TESTING Section. If the magnetic inspection process is used, the dry method with direct current must 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. Proposed weld inspection method must be included with the submittal information package for review.

PAINTING

7. (a) Oil and Grease Removal. All metal surfaces must be washed with an alkaline detergent to remove oils and 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-SP10. Included in this process, the pretreatment process and the painting process will be the interior base section of the mast to a minimum height of 12".

(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) Exterior Coat. A thermosetting, weathering, Polyester powder coat must be applied electrostatically to all cleaned and treated surfaces to a uniform 8 mil thickness in a one coat application. This powder coat must be cured in a convection oven at a minimum temperature of 400^{o}F to form a high molecular weight fusion bonded finish.

(e) Alternate Methods. Alternate powder coat 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.

(f) Interior Coat. The interior metal surfaces must be powder coated with a thermoplastic hydrocarbon resin containing corrosion inhibitors. The resin must be formulated for full application over untreated metal surfaces. The resin must be applied at a temperature of approximately 200^{o}F to a minimum thickness of 3 mils. The interior thermoplastic coat must overlap the interior, thermosetting base coat by approximately 6". Alternate interior coatings may be used subject to prior approval of the Commissioner.

(g) Durability. Both the exterior and interior coats must be capable of passing 1,000 hours of salt spray exposure per ASTM B117 in a 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 be not less than 7.0 mils.

(i) Color. Color must be gloss black unless noted otherwise on the order. A 4" square color chip sample must be submitted for approval prior to fabrication. The chip sample must be of the same material as the pole mast, and must include the manufacturer's name and the manufacturer's color name as well. The sample must also include any other information required to purchase the same color for the split pedestal base.

TESTING

8. (a) Testing. Structural testing must be conducted on 5% of the manufacturer's production masts for each order in which the quantity of masts is 20 or more. The testing must include coupon tests, load tests, and weld tests. All testing must be certified by the manufacturer, or an independent lab.

(b) The selection of pole masts must be a random selection from the entire completed lot of pole masts on the order.

(c) Material Test. Coupon tests as outlined in ASTM A53 and A 595, A588, or A606.

(d) Load tests for masts as described herein. With base rigidly anchored, a test load of 1000 pounds 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 mast and in the same vertical plane. The deflection must not be greater than 13". Within one (1) minute after the test load is released, measurement will be made of the set taken by the mast. This set must not be greater than 1.0". 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 ±5%. No measurable set must be noted within one (1) minute after test load is released. The mast must then be checked to insure that it is still securely fastened, that it is plumb, and that no cracks have developed in either the mast or base plate.

(e) Weld tests as described in the WELDING Section of this Specification.

SHIPMENT AND DELIVERY

9. (a) General. The poles must be carefully inspected at the factory prior to shipment to assure that the poles are complete and free of defects. When poles are stacked together, they must be supported with suitable spacers or must otherwise be protected from dents and other potential shipping damage. The spacing and protective materials must be suitable for and usable in the storage of the poles. All hardware must be packaged in a clear container and labeled.

(b) Packaging. The poles must be shipped in bundles weighing a maximum of 5,000 pounds. Each pole must be individually wrapped so that it can be bundled and unbundled without damage to the pole or its finish. Each pole wrapping must be clearly labeled, using 2 inch letters identifying the pole type, manufacturer, and date of manufacture. Specific instructions must be securely attached to each bundle indicating the proper methods of storage. In addition, each bundle must contain specific instructions on unbundling and erection of poles. Instructions must be printed on a fiber based paper with a permanent ink so that instructions will be completely legible after weathering outdoors for a minimum of 5 years.

(c) Bundles. The bundles will consist of poles 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 will be used to make a rigid, long lasting bundle capable of being handled, shipped and stored without shifting of contents or breaking. Bundling procedure will be subject to approval. Any bundles, in which either poles 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 high without breaking, or shifting of the contents. Each bundle must be capable of being lifted by a forklift truck or crane and the bundles must be shipped on a flat bed truck to facilitate unloading.

(d) Appurtenant Devices and Hardware. Any appurtenant devices and hardware not attached to the pole must be carefully wrapped and securely attached to each bundle. Payment will be withheld for any units provided without the appropriate appurtenant devices and hardware. Cracked, broken, chipped or damaged units will also be considered as incomplete quantities as regards payment.

ELECTRICAL SPECIFICATION 1505
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED JULY 17, 2006

CHICAGO 2000 LIGHT POLE: ANCHOR BASE, 32'-6", 7 GAUGE FLUTED, TAPERED STEEL FOR 15" BOLT CIRCLE

SUBJECT

1. This specification states the requirements for an Anchor Base Chicago 2000 Light Pole. The pole must support single or twin, simplex mounted mast arm(s) and teardrop luminaire(s). A split pedestal base will be provided to cover the bottom nominal 40" of the pole. A finial will be mounted at the top of the pole. This pole will be served by underground cables.

SUBMITTAL INFORMATION REQUIRED

2. (a) Manufacturer's Shop Drawings. Scaled manufacturer's shop drawings showing actual light pole dimensions, details, and welds. Shop drawings must be original engineering drawings created by the manufacturer; photocopied or scanned copies of the Standard Drawings will not be accepted and will be rejected as an incomplete submittal. These drawings must also be submitted in electronic format in MicroStation 95, if requested; failure to provide drawings in this format will be cause for rejecting the submittal.

Dimensions must include but will not be limited to: mast height, width, taper, and fluting; base plate length, width, thickness, and bolt circle; handhole length, width, and height above base plate; component attachment plan locations and heights above baseplate including simplex brackets, finial top, banner arms, and flower basket rosettes; and all decorative bracelet heights above base plate.

Details must include scaled and dimensioned plan views, front elevations, side elevations, and section views as required for components including but not limited to: handhole; simplex brackets; finial top; banner arm attachments and finials; flower basket rosettes; and all decorative bracelets. All components must be clearly identified on the drawings.

Welds must include but will not be limited to: locations, sizes, and types of welds in accordance with the WELDING Section of this Specification.

(b) Manufacturer's catalog cut sheets showing light pole designation(s), characteristics, and catalog number(s).

(c) Manufacturer's specifications including fabricating materials and processes.

(d) Manufacturer's written installation instructions and maintenance manuals including recommendations and/or procedures for storage, assembly, orientation, installation, component access and wiring, and numeric tolerances for torquing the foundation anchor bolts to the light pole base plate.

(e) Sample. If requested by the Chief Procurement Officer, one completely assembled anchor-base pole with integral components, or one mast head and finial, or ornamental bracelets, of the manufacture intended to be furnished, must be submitted for review within fifteen (15) business days from receipt of notice.

(f) Warranty. The manufacturer must warrant the performance and construction of these light poles to meet the requirements of this specification and must warrant all parts, components, and appurtenances against defects due to design, workmanship, or material developing within a period of five years after the light poles have been delivered. This will be interpreted particularly to mean structural or mechanical failure of any component, failure of any weld, or failure of any portion of the painting system. The warranty must be furnished in writing guaranteeing replacement, including shipment, free of charge to this Contract and to the City, of any light pole assembly, or any component parts thereof, which, as determined by the Commissioner, would develop aforesaid failures. The warranty must accompany submittal information. Any light pole or part thereof not performing as required or developing defects within this period, must be replaced by the manufacturer at no cost 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. Any cost for the warranty as specified will be incidental to this contract.

GENERAL

3. (a) Products. Light pole masts and component equipment must be the products of a single, established manufacturer, and must be suitable for the service required. Light pole masts or component equipment items which are proposed as similar or identical must be the products of a single manufacturer. Masts will be manufactured by Union Metal Corporation, Valmont Industries Incorporated, or an approved equal.

(b) Specifications. The pole shall conform in detail to the requirements herein stated and to the requirements of the following organizations as cited herein:

American Association of State Highway and Transportation Officials (AASHTO)

American Society for Testing and Materials (ASTM)
American Welding Society (AWS)
Society for Protective Coatings (SSPC)

(c) Drawings. The drawings mentioned herein are drawings of the Department of Transportation being an integral part of this specification cooperating to state the necessary requirements.

(d) Design. The pole must conform in design and dimensions to corresponding Standard Drawings 930, 930C, and 724.

(e) Approval. Whenever "approval" and "approved" are used in this specification they will mean a written approval by the Commissioner to be secured prior to proceeding with manufacture of these light poles.

(f) Commissioner's Review. The Commissioner will be the sole judge in determining the submitted light pole compliance with this Specification. The Commissioner's decision will be final.

MAST

4. (a) Mast Size. The mast size must be nominally 32'-6" as shown on Standard Drawing 930. The mast diameter at the bottom must be 10".

(b) Mast Design. The mast must be tapered at 0.14" per foot. The 32'-6" long mast must be of monotube construction and must be rolled on a mandrel to provide a 16-flute pattern. The flutes must be neat, true to pattern, and free from cracks and flaws. Each mast must be straight and centered on its' longitudinal axis. The mast must utilize a single longitudinal weld, 70% minimum penetration, in accordance with the WELDING Section of this Specification. There must be no lateral welds in the mast other than at the base plate and at the flower basket rosettes.

(c) Material. The mast must be 7 gauge, high strength low alloy steel in accordance with ASTM A595, Grade A.

(d) Mast Base. The mast base must be a 1¼" thick steel plate of low alloy, high strength steel conforming to ASTM A 595, Grade C, ASTM A 588 or ASTM A 606.

1. The base must be attached to the mast so that the bearing surface of the base is at right angles to the longitudinal axis of the mast. The vertical center line of the seam must be positioned 135˚ counter-clockwise from the vertical center line of the mast arm support plates.

2. The mast must be inserted into the base to a maximum depth which will still allow for an adequate weld to be made between the bottom

of the mast and the plate. A circumferential weld must be made between the mast and the base at both the top and underside of the plate.

3. The base plate must have four (4) 1 1/2" wide slots to accommodate 1 1/4" diameter anchor bolts. The slots must be a total of three inches long measured along the circumference. The mast must provide for mounting on a 15" bolt circle using 1 1/4" anchor bolts, nuts and washers provided by others. Any special hardware required to facilitate installation must be provided under this contract.

(e) Provision for Ground. A 1/2" - 13 square nut must be welded to the inside of the mast on the handhole entry frame for a ground connection.

(f) Entry. A vertical doorframe carrying a removable door providing access to the interior of the mast must be welded into a close fitting opening centered approximately 24" above the bottom of the base. The doorframe must be formed and welded of steel with cross section not less than 1-1/2" wide by 1/4" inch thick so as to adequately reinforce the opening of the mast. The internal horizontal clearance of the doorframe must be 4"; its internal vertical height must be 8". Its upper and lower ends must be semi-circular meeting its straight sides tangentially. The frame must have two welded tabs; one at the top and one at the bottom of the door frame. The top hole must be located 13/16 of an inch from the top of the opening. The bottom hole must be located 13/16 of an inch from the bottom of the opening. These tabs must be drilled to accept a 1/4 inch screw. Stainless steel spring clips must be mounted to the tabs. These clips must be made to accept 1/4"-20 machine screws. The entry must in all respects be identical to handhole openings on poles that have already been installed and accepted by the City.

(g) Door. The removable door must be formed of sheet steel approximately 1/8" thick. It must fit the doorframe closely and be dished so that it will stay in proper position even if its locking screws become slightly loosened. The door must be drilled top and bottom to accept the 1/4" - 20 hex head stainless steel screws which will fasten the door to the doorframe. All doors must be interchangeable. Doors must fit pole handholes of like poles that have already been installed and accepted by the City. Alternate methods will be subject to approval by the Commissioner or his fully authorized representative.

(h) Tag. A stainless steel tag must be attached to each pole immediately below the handhole by mechanical means and not by adhesive. The stainless steel tag must have an embossed legend which must include the pole outside diameter at the base, the overall length, and the gauge; i.e. 10" x 32'-6" - 7 gauge.

(i) Interchangeability. Each member including the handhole doors in the pole and all component equipment must be mutually interchangeable for assembly, so that no work will be required to make any member fit properly in the place of any other similar member of any other similar pole.

(j) Simplex Brackets. Two simplex mast arm support plates must be provided opposite each other as shown on the Drawings, and in accordance with Standard Drawing No. 659. The mast arm support plates must be made of cast steel conforming to the requirements for Grade 65-35 cast steel of ASTM A27, or equivalent, subject to approval. They must neatly fit the external surfaces of the fluted mast. Each mast arm support plate must have a hollow protuberance, the hole of which must be approximately equivalent to two (2) inches in diameter, extending into the interior of the pole providing a smooth surface for the lamp cables to rest upon. Each mast arm support plate must be designed so that it will carry the mast arm and hold it in the proper position for fastening the mast arm to the mast. The design of the mast arm support plates must be a two (2) bolt type as shown on Drawing No. 659. The brackets must be factory assembled to the mast. The finished mast must give the appearance of a single, homogeneous mast and the entire assembly must be structurally sound so that with the weight of the mast arm(s) and luminaire(s), the mast will not twist, rack, vibrate or otherwise deform when subjected to the severe vibrations of wind loading, passing elevated trains or heavily loaded vehicles.

(k) Flower Basket Rosettes. The pole must be equipped with flower basket rosettes welded to the pole at the factory. Other flower basket attachments are not integral to the pole and are optional.

(l) Luminaire Mounting Height. The luminaire mounting height indicates the height necessary to provide a distance of 30.0 feet from the top of the light pole foundation to the light source center of the luminaire.

BANNER AND BASKET ATTACHMENTS (Optional)

5. (a) Optional Attachments. Banner arm attachments and flower basket attachments must be provided as an option. These items must be provided only if ordered as a separate line item. All attachments must be manufactured to properly fit the pole shaft. All castings and parts must be permanently labeled on the back. The label must clearly identify the part and the pole it is to be used for.

(b) Banner Arms. Banner arms, bracelets, couplings, and hardware necessary to attach banners must be provided. The appearance and dimensions of these items are shown on Standard Drawings 930, 930B, and 930C. Unless otherwise noted, the banner arms must be constructed of a light weight material flexible enough to withstand the loads presented by the appropriate

size banners under ASSTHO wind loadings. The banner arms must have an approximate outside diameter of 1-3/4".

(c) Flower Basket Attachments. The bracelet and all necessary hardware for attaching a flower basket must be provided. The appearance and dimensions of these items are shown on the Standard Drawings.

FINIAL TOP (Optional)

6. (a) Design. The finial mast top must include different pieces assembled together to resemble a single, uniform casting. The pieces must include a top, two side pieces and a side finial ball as shown on Standard Drawings 930, 930B, and 930C. Two sets of end covers for the arms should be included to accommodate the possible use of two arms. The top must be essentially conical with a globe-shaped lower-end and have a minimum wall thickness throughout of not less than 5/32 inches. The cone portion must meet the skirted portion of the top in a smooth filet, and the skirt must enclose the top 7/8 inches of the mast. Three stainless steel, or other similar approved material, set screws not less than 5/16 inches long must be equally spaced in tapped holes around the skirt and must hold the top securely in place atop the mast. The design of the top must be as shown on the Standard Drawings. All castings and parts must be permanently labeled on the back of the part. The part label must clearly identify the part and the pole it is intended for.
All mast heads and finials must have the appearance as shown on the Standard Drawings. The dimensions on the drawings are for attachment to the Chicago 2000 Gateway pole. Mast heads and finials for combination traffic poles, 11"or 12.5"poles, must be sized accordingly.

(b) Material. The top finial must be made of aluminum alloy 356-F per ASTM B108. The top must have smooth surfaces, neat edges and corners and be free of fins, holes or other casting flaws.

(c) Finish. Tops must be painted as herein specified. The color shall be black.

HARDWARE

7. All the hardware necessary to complete the assembly of the pole must be furnished. All hardware must be stainless steel, or equal corrosion-resistant metal, subject to approval.

WELDING

8. (a) General. Where welds are required and approved, each welded joint must be thoroughly cleaned of flux and spatter, and must be made in conformity with the standards of the American Welding Society. Each bidder must submit with his proposal a drawing showing the sizes and types of welds, in

conformity with the proper interpretation of the standard welding symbols of the American Welding Society. The bidder's proposal must state the type of electrode and must describe the welding methods proposed for use in fabricating the pole.

(b) Certifications. Welders must have proper certification for the welding operations required. Welding by non-certified personnel will not be allowed. Certifications for welding personnel must be included with the submittal information package for review.

(c) Testing. All welds of 5% of the poles 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 will be governed by the same conditions as in the TESTING Section. If the magnetic inspection process is used, the dry method with direct current must 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. Proposed weld inspection method must be included with the submittal information package for review.

PAINTING

9. (a) Oil and Grease Removal. All metal surfaces must be washed with an alkaline detergent to remove oils and 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-SP10. Included in this process, the pretreatment process and the painting process must be the interior base section of the mast to a minimum height of 12".

(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) Exterior Coat. A thermosetting, weathering, Polyester powder coat must be applied electrostatically to all cleaned and treated surfaces to a uniform 8 mil thickness in a one coat application. This powder coat must be cured in a convection oven at a minimum temperature of 400^{o}F to form a high molecular weight fusion bonded finish.

(e) Alternate Methods. Alternate powder coat 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.

(f) Interior Coat. The interior metal surfaces must be powder coated with a thermoplastic hydrocarbon resin containing corrosion inhibitors. The resin must be formulated for full application over untreated metal surfaces. The resin must be applied at a temperature of approximately 200°F to a minimum thickness of 3 mils. The interior thermoplastic coat must overlap the interior, thermosetting base coat by approximately 6". Alternate interior coatings may be used subject to prior approval of the Commissioner.

(g) Durability. Both the exterior and interior coats must be capable of passing 1,000 hours of salt spray exposure per ASTM B117 in a 5% NaCl (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 be not less than 7.0 mils.

(i) Color. Color must be gloss black unless noted otherwise in the order. A 4" square color chip sample must be submitted for approval prior to fabrication. The chip sample must be of the same material as the pole mast, and must include the manufacturer's name and the manufacturer's color name as well. The sample must also include any other information required to purchase the same color for the mast arm(s), flower baskets, and the cast aluminum finial and split pedestal base.

STRUCTURAL REQUIREMENTS

10. The pole must be manufactured in accordance with AASHTO's 1994 version of the "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals." The shaft and base plate assembly must be designed to meet AASHTO's 1994 criteria for 80 MPH wind loading with a 30% gust factor. The mast must be designed to support twin gateway mast arms with twin gateway luminaires of not less than 65 pounds each and having an effective projected area (EPA) of not less than 1.70 square feet each with twin gateway luminaire fitters of not less than 50 pounds each and having an EPA of not less than 0.73 square feet each. In addition, the mast must be able to support twin banners 6 feet high by 1.5 feet wide each; and twin flower baskets weighing 75 pounds each and having an EPA of not less than 3.0 square feet each.

TESTING

11. (a) Testing. Structural testing must be conducted on 5% of the manufacturer's production masts for each order in which the quantity of masts is 20 or more.

The testing must include coupon tests, load tests, and weld tests. All testing must be certified by the manufacturer.

(b) The selection of pole masts must be a random selection from the entire completed lot of pole masts required for the Contract. Selections from partial lots will not be allowed.

(c) Coupon tests as outlined in ASTM A53 and A 595, A588, or A606.

(d) Load tests for masts. With base rigidly anchored, a test load of 1500 pounds 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 mast and in the same vertical plane. The deflection must not be greater than 30". Within one (1) minute after the test load is released, measurement must be made of the set taken by the mast. This set must not be greater than 2.5". 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 ±5%. No measurable set must be noted within one (1) minute after test load is released. The mast must then be checked to ensure that it is still securely fastened, that it is plumb, and that no cracks have developed in either the mast or base plate.

(e) Load tests for masts arm supports. With gateway mast arms rigidly anchored, a test load of 300 pounds must be applied to each mast arm at a point approximately seven feet (7'-0") from the pole mast. The load must be applied at right angles to the center line of the mast arm and in the same vertical plane. Each mast arm support must then be checked to ensure that it is still securely fastened and that no cracks have developed in either mast arm support bracket or the weld.

(f) Load tests for flower basket rosettes. With base rigidly anchored, a test load of 150 pounds must be applied to each rosette ring. The load must be applied at right angles to the center line of the mast and in the same vertical plane. Each rosette must then be checked to ensure that it is still securely fastened and that no cracks have developed in either the ring, rosette, or rosette weld.

(g) Weld tests as described in the WELDING Section of this Specification.

PACKAGING

12. (a) General. The poles must be carefully inspected at the factory prior to shipment to assure that the poles are complete and free of defects. When poles are stacked together, they must be supported with suitable spacers or must otherwise be protected from dents and other potential shipping damage. The spacing and protective materials must be suitable for and usable in the storage of the poles. All pole hardware must be packaged in a clear container

and labeled. Castings and parts must be packaged in clearly labeled boxes. Parts hardware must be packaged in clear containers, properly labeled.

(b) Pole Packaging. The poles must be shipped in bundles weighing a maximum of 5,000 pounds. Each pole must be individually wrapped and protected so that it can be bundled and unbundled without damage to the pole or its finish. Each pole wrapping must be labeled using permanent ink in two-inch letters identifying the pole type, height, and gauge. Specific instructions must be securely attached to each bundle indicating the proper methods of storage. In addition, each bundle must contain specific instructions on unbundling and erection of poles. Instructions must be printed on a fiber-based paper with a permanent ink so that instructions will be completely legible after weathering outdoors for a minimum of 5 years.

(c) Pole Bundles. The bundles must consist of poles 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. Bundling procedure will be subject to approval. Any bundles, in which either poles 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 high without breaking or shifting of the contents. Each bundle must be capable of being lifted by a forklift truck or crane and the bundles must be shipped on a flat bed truck to facilitate unloading.

(d) Pole Hardware. Any appurtenant devices and hardware not attached to the pole must be carefully wrapped and securely attached to each bundle. Payment will be withheld for any units provided without the appropriate appurtenant devices and hardware. Cracked, broken, chipped or damaged units will also be considered as incomplete quantities as regards payment.

(e) Castings and Parts. Castings and parts, such as the finial, banner brackets, etcetera, must be individually wrapped and packaged in boxes. Hardware must be packaged in a clear package, clearly labeled. The label must identify each piece of hardware and the quantity of each, as well as what part the hardware is intended for. An individual box must contain like part types and the related hardware (i.e. the upper banner bracelet halves and hardware must be boxed separately from the lower banner bracelet halves and hardware). Each box must be labeled with 3/8" letters identifying the manufacturer, the casting or part numbers, the part name, the date of manufacture, the City contract number, and the City Commodity code.

ELECTRICAL SPECIFICATION 1513
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED MARCH 7, 2014

SPLIT PEDESTAL BASE: FOR CHICAGO 2000 LIGHT POLE

SUBJECT

1. This specification states the requirements for a split pedestal base (Clamshell) for installation on a 10 inch by 32 foot- 6 inch tapered fluted Chicago 2000 light pole. This specification will address the requirements for a split fiberglass base without doors.

SUBMITTAL INFORMATION REQUIRED

2. (a) Manufacturer's Shop Drawings. Scaled manufacturer's shop drawings showing actual split pedestal base dimensions and details. Shop drawings must be original engineering drawings created by the manufacturer; photocopied or scanned copies of the Standard Drawings will not be accepted, and will be rejected as an incomplete submittal. If requested by the City, these drawings must also be submitted in electronic format in Microstation 95; failure to provide drawings in this format will be cause for rejecting the submittal.

   Dimensions must include but will not be limited to: base height, width, pattern, and fluting. Details must include scaled and dimensioned plan views, front elevations, side elevations, and section views as required.

   (b) Manufacturer's catalog cut sheets showing split pedestal base designation, and catalog number.

   (c) Manufacturer's specifications including fabricating materials and processes.

   (d) Manufacturer's written installation instructions and maintenance manuals including recommendations and/or procedures for storage, assembly, orientation, and installation.

   (e) Sample. If requested by the Chief Procurement Officer, one completely assembled split pedestal base with hardware and all components, of the manufacture intended to be furnished, shall be submitted for review within fifteen (15) business days from receipt of notice. The sample base must be coordinated with an existing Chicago 2000 light pole for accuracy of fit.

(f) Warranty. The manufacturer must warrant the performance and construction of these split pedestal bases to meet the requirements of this specification and must warrant all parts, components, and appurtenances against defects due to design, workmanship, or material developing within a period of five years after the bases have been delivered. This will be interpreted particularly to mean structural or mechanical failure of any component, or failure or fading of the surface color. The warranty must be furnished in writing guaranteeing replacement, including shipment, free of charge to the City, of any split pedestal base, which, as determined by the Commissioner, would develop aforesaid failures. Any split pedestal base, or part thereof not performing as required or developing defects within this period, must be replaced by the manufacturer at no cost 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. Any cost for the warranty as specified must be incidental to this contract.

GENERAL

3. (a) Products. Split pedestal bases must be the products of established manufacturers and must be suitable for the service required. Split pedestal bases which are proposed must be the products of a single manufacturer. Fiberglass bases must be manufactured by Shakespeare Company, W.J. Whatley, Incorporated, or an approved equal.

(b) Specifications. The split pedestal bases must 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.

(c) Drawings. The drawings mentioned herein are drawings of the Department of Transportation being an integral part of this specification cooperating to state the necessary requirements.

(d) Design. The base must conform in design and dimensions to Standard Drawings 930 and 930A.

(e) Approval. Whenever "approval" and "approved" are used in this specification they will mean a written approval by the Commissioner to be secured prior to proceeding with manufacture of the split pedestal bases.

(f) Commissioner's Review. The Commissioner will be the sole judge in determining the submitted split pedestal bases compliance with this specification. The Commissioner's decision will be final.

CONSTRUCTION OF FIBERGLASS BASE

4. (a) Each pedestal base must be formed of a fiberglass composite consisting of a polyester resin and containing a minimum of 65% fiberglass by weight. The resin must contain no clay fibers. The composite must be UV and weather resistant. Alternate materials may be considered. Each base half must be permanently marked on the inside identifying it as a base for a Chicago 2000 light pole.

(b) The split pedestal base must conform in detail and dimensions to Standard Drawings 930 and 930A.

(c) The two halves of the clamshell must be identical to each other. They must be perfectly matched and when installed there shall be no more than a 0.125 inch gap between the inside top of the assembled base and the outside surface of the mast.

(d) Once installed, the base should be designed to remain in place without the use of set screws. An installed base should not be able to be shifted or rotated.

(e) The color of the base must be gloss black and must match the color of existing and proposed Chicago 2000 light poles. The resin must contain color pigment throughout. The pigment must be even throughout the thickness of the base. A finish coat of urethane enamel must be applied to the surface of the base to a minimum dry thickness of 1.5 mils. The resin color must match the enamel color. A paint sample on fiberglass must be submitted for approval prior to production. The paint manufacturer's name and any information necessary to acquire the same color for the pole must be provided. The contractor must supply one quart of touch-up paint for every 50 bases ordered.

(f) The texture of the fiberglass base exterior surface must be equal to that of a cast iron base. Acceptance of the aesthetic appearance of the base will be by the Commissioner.

(g) The two halves of the shroud must be affixed by means of screws as shown on the Standard Drawings. The screws must fit so that the halves of the base are drawn together so that the edges of the base fit snug against each other. Threaded stainless steel inserts in the base must be used to affix the screws. The screws must not detract from the appearance of the base. Other methods of attachment may be considered. Any method of attachment must be approved by the Commissioner.

TESTING

5. (a) Testing. All completed fiberglass bases must be available for testing. Unless specifically authorized in writing, all tests must be at the manufacturer's plant. A record of every test must be made and a certified copy of the test record must be submitted to the Commissioner before the units are shipped. Tests shall be standardized according to ASTM requirements or other suitable organization's standards. The manufacturer must provide evidence that the bases are structurally

sound and are able to take the normal abuse of salt spray, freeze-thaw cycles, and exposure to moisture. The bases must be impact resistant and must be resistant to UV damage.

PACKAGING

6. (a) General. The split pedestal bases must be carefully inspected at the factory prior to shipment to assure that the bases are complete and free of defects. When bases are stacked together, they must be supported with suitable spacers or must otherwise be protected from dents and other potential shipping damage. The spacing and protective materials must be suitable for and usable in the storage of the bases. All hardware must be packaged in a clear container and labeled as to size, quantity, and part association.

(b) Packaging. The split pedestal bases must be shipped on pallets with at least six units per pallet. Each base must be individually wrapped and protected so that it can be bundled and unbundled without damage to the base or its finish. The base wrapping must be labeled to identify the base. Specific instructions must be securely attached to each pallet indicating the proper methods of storage. In addition, each pallet must contain specific instructions on the installation of the split pedestal bases. Instructions must be printed on a fiber based paper with a permanent ink so that instructions will be completely legible after weathering outdoors for a minimum of 5 years. The pallets must be labeled in 3/8 inch high lettering indicating the type of base as “FIBERGLASS BASE FOR CHICAGO 2000 LIGHT POLE”, the part number, the manufacturer, the date of manufacture, and the contract number.

(c) Hardware. Any hardware not attached to the bases must be carefully wrapped and securely attached to each pallet. Hardware must be packaged in a clear bag with a label indicating the type of hardware and quantity. Payment will be withheld for any units provided without the appropriate hardware, or for any missing or improper packaging or labeling. Cracked, broken, chipped or damaged units will also be considered as incomplete quantities as regards payment.

(d) Touch-up Paint. Touch-up paint and appurtenant materials must be packaged in units sufficient for the number of bases on each pallet. These units will be securely attached to each pallet.

ELECTRICAL SPECIFICATION 1514
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED MARCH 7, 2014

CHICAGO 2000 MAST ARM: 8-FOOT, STEEL

SUBJECT

1. This specification covers the requirements for an 8-foot straight steel mast arm and decorative scroll for supporting a teardrop street light luminaire on a Chicago 2000 light pole or other pole fitted for a simplex attachment.

SUBMITTAL INFORMATION REQUIRED

2. (a) Manufacturer's Shop Drawings. Scaled manufacturer's shop drawings showing actual mast arm and scroll dimensions, details, and welds. Shop drawings must be original engineering drawings created by the manufacturer; photocopied or scanned copies of the Standard Drawings will not be accepted, and will be rejected as an incomplete submittal. These drawings must also be submitted in electronic format in Microstation 95, if requested by the City; failure to provide drawings in this format will be cause for rejecting the submittal.

Dimensions must include but will not be limited to: mast arm length, diameter, and ornamentation; attachment plate length, width, thickness, and bolt circle; scroll length, cross section dimensions, and shape.

Details must include scaled and dimensioned plan views, front elevations, side elevations, and section views as required for components including but not limited to: attachment plates; ornamentation; and arm attachments.

Welds must include but will not be limited to: locations, sizes, and types of welds in accordance with the WELDING Section of this specification.

(b) Manufacturer's catalog cut sheets showing mast arm and scroll designation(s), characteristics, and catalog number(s).

(c) Manufacturer's specifications including fabricating materials and processes.

(d) Manufacturer's written installation instructions and maintenance manuals including recommendations and/or procedures for storage, assembly,

orientation, installation, component access and wiring, and numeric tolerances for torquing the attachment plate bolts to the light pole mast arm support plate.

(e) Sample. If requested by the Chief Procurement Officer, one completely assembled gateway mast arm with scroll and integral components, of the manufacture intended to be furnished, must be submitted for review within fifteen (15) business days from receipt of notice.

(f) Warranty. The manufacturer must warrant the performance and construction of these mast arms and scrolls to meet the requirements of this specification and must 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 and scrolls have been delivered. This will be interpreted particularly to mean structural or mechanical failure of any component, failure of any weld, or failure of any portion of the painting system. The warranty must be furnished in writing guaranteeing replacement, including shipment, free of charge to this Contract and to the City, of any mast arm assembly, or any component parts thereof, which, as determined by the Commissioner, would develop aforesaid failures. The warranty must accompany submittal information. Any mast arm or part thereof not performing as required or developing defects within this period, must be replaced by the manufacturer at no cost 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. Any cost for the warranty as specified will be incidental to this contract.

GENERAL

3. (a) Products. Mast arms and component equipment must be the products of established manufacturers, and must be suitable for the service required. Mast arm or component equipment items which are proposed as similar or identical must be the products of a single manufacturer. Mast arms must be manufactured by Union Metal Corporation, Valmont Industries Incorporated, Millerbernd Manufacturing Company, or an approved equal.

(b) Specifications. The mast arm and scroll must conform in detail to the requirements herein stated and to the requirements of the following organizations as cited herein:

American Association of State Highway and Transportation Officials (AASTHO)
American Society for Testing and Materials (ASTM)
American Welding Society (AWS)
Society for Protective Coatings (SSPC)

(c) Drawings. The drawings mentioned herein are drawings of the Department of Transportation being an integral part of this specification cooperating to state the necessary requirements.

(d) Design. The mast arm and scroll must conform in design and dimensions to Standard Drawings 930 and 930C.

(e) Approval. Whenever "approval" and "approved" are used in this specification they will mean a written approval by the Commissioner to be secured prior to proceeding with manufacture of these mast arms and scrolls.

(f) Commissioner's Review. The Commissioner will be the sole judge in determining the submitted mast arms compliance with this specification. The Commissioner's decision will be final.

ARM DESIGN

4. (a) 8-Foot Mast Arm. Each 8-foot mast arm must be fabricated from a continuous, single piece, two (2) inch "extra strong" steel pipe conforming to the requirements of ASTM A53, Table X2. It must conform in detail with the mast arm shown on Standard Drawings 930 and 930C.

(b) Mast Arm Attachment. The mast arm attachment to be welded to all mast arms must conform to Standard Drawing 724. It must be a steel forging per ASTM A668, Class D, or cast steel conforming to the requirements for Grade 65-35 cast steel of ASTM A27, or it can be fabricated from weathering steel plate. It must be so designed that it may be fitted over the mast arm supports on the pole and be held by the mast arm supports in proper position without other support. Provision must be made for fastening the attachment to each mast arm support by two special screws and washers as noted in the HARDWARE Section of this Specification.

(c) Entryway for Wires. A drilled opening lined with a neoprene grommet having inserted therein a neoprene plug must be provided on the underside of the upper member of all arms approximately three inches from the point of attachment. The clear opening must not be less than 5/8 inch in diameter. Its design must be submitted for approval by the Commissioner or his authorized representative.

(d) Mast Arm Members. All mast arm members must conform with the type of steel required for the arm specified. The members must be continuous lengths of pipe and bar cut to the proper size to fabricate the mast arm lengths requested. No butt welded, swaged and welded or other pieced together configurations of pipe and bar lengths will be accepted. The outer and inner surfaces of the pipes and bars must be smooth and even without protrusions, nicks, holes or other imperfections.

(e) Interchangeability. Each member including the arm and all component equipment must be mutually interchangeable for assembly, so that no work will be required to make any member fit properly in the place of any other similar member of any other similar mast arm.

SCROLL DESIGN

5. (a) Scroll. The scroll must be fabricated out of 3/4 inch thick by 2-1/2 inch wide bar stock meeting the requirements of ASTM A36. The scroll must be formed as shown on Standard Drawing 930.

(b) Clamps. The scroll must be attached to the mast arm and pole by clamps, as shown on Standard Drawing 930. The clamps must meet the requirements of ASTM A307 galvanized to ASTM A153. All connecting hardware must meet the requirements of the HARDWARE Section of this Specification.

(c) Identification. The scroll and clamps must be permanently labeled for identification purposes. The identification must not affect the aesthetics of the scroll.

WELDING

6. (a) General. Where welds are required and approved, each welded joint must be thoroughly cleaned of flux and spatter, and must be made in conformity with the standards of the American Welding Society. Each bidder must submit with his proposal a drawing showing the sizes and types of welds, in conformity with the proper interpretation of the standard welding symbols of the American Welding Society. The bidder's proposal must state the type of electrode and must describe the welding methods proposed for use in fabricating the mast arm.

(b) Certifications. Welders must have proper certification for the welding operations required. Welding by non-certified personnel will not be allowed. Certifications for welding personnel must be included with the submittal information package for review.

(c) Testing. All welds of 5% of the mast arms and scrolls 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 will be governed by the same conditions as in the TESTING Section. If the magnetic inspection process is used, the dry method with direct current must be employed. All transverse welds must be magnetized by the "prod" (Circular Magnetization) method. Proposed weld inspection method must be included with the submittal information package for review.

HARDWARE

7. Two (2) special 1/2" - 13 NC x 1-1/2" long stainless steel cap screws, and two (2) stainless steel flat washers, must be provided for each mast arm attachment. All other hardware necessary to complete the assembly of the mast arm and scroll must be furnished. All hardware must be stainless steel, or equal corrosion-resistant metal, subject to approval.

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-SP10.

(c) Chemical Pretreatment. The cleaned metal surfaces must be treated with a hot, pressurized iron phosphate wash and must be dried by convection heat.

(d) Exterior Coat. A Thermosetting, polyester powder coat must be applied electrostatically to all cleaned and treated surfaces to a uniform eight (8) mil thickness in a one coat application. This powder coat must be cured in a convection oven at a minimum temperature of 400^{o}F to form a high molecular weight fusion bonded finish.

(e) Alternate Methods. Alternate powder coat 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.

(f) Interior Coat. The interior metal surfaces must be powder coated with a thermoplastic hydrocarbon resin containing corrosion inhibitors. The resin must be formulated for application over untreated metal surfaces. The resin must be applied at a temperature of approximately 200^{o}F to a minimum thickness of three (3) mils. The interior thermoplastic coat must overlap the interior, thermosetting base coat by approximately one (1) inch. Alternate interior coatings may be used subject to prior approval of the Commissioner.

(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 5% NaC1 solution at 95^{o}F and 95% relative humidity without blistering.

(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 be not less than 7.0 mils.

(i) Color. Color must be gloss black unless noted otherwise in the order. A 4" square color chip sample must be submitted for approval prior to fabrication. The chip sample must be of the same material as the mast arm, and must include the manufacturer's name and the manufacturer's color name as well. The sample must also include any other information required to purchase the same color for the pole mast and the cast aluminum finial and split pedestal base.

(j) Field Touch-up. Any minor damage to the mast arm surfaces must be touched-up in a professional manner as recommended by the paint manufacturer, with protective coating solutions as provided by the mast arm manufacturer at no additional cost to the City. Any major damage to the mast arm shaft or component surfaces must be repaired at the manufacturer's place of business, or must be replaced as directed by the Commissioner. The Commissioner will be the sole judge of the extent of any such damage and the adequacy of repair. The Contractor must supply a field touch-up kit for every 20 mast arms or fraction thereof. Each kit must consist of a highly legible instruction sheet, one gallon of the recommended touch-up paint and all other materials required to touch-up 20 mast arms and scrolls.

STRUCTURAL REQUIREMENTS

9. The arm must be manufactured in accordance with AASHTO's 1994 "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals." The mast arm and attachment plate assembly must be designed to meet AASHTO's 1994 criteria for 80 MPH wind loading with a 30% gust factor, for gateway luminaires of not less than 65 pounds each and having an effective projected area (EPA) of not less than 1.70 square feet each; and twin gateway luminaire fitters of not less than 50 pounds each and having an EPA of not less than 3.5 square feet each.

TESTING

10. (a) Testing. Structural testing must be conducted on 5% of the manufacturer's production mast arms and scrolls for each order in which the quantity is 20 or more. The testing must include coupon tests, load tests, and weld tests. All testing must be certified by the manufacturer, or an independent lab.

(c) The selection of mast arms and scrolls must be a random selection from the entire completed lot required in the order.

(d) Coupon tests for the arm and the scroll as outlined in ASTM A53, A 668, A27, or A36.

(e) Load tests for mast arms. The scroll must not be considered as part of the load test. With mast arm rigidly anchored, a test load of 300 pounds must be applied at a point approximately one foot (1'-0") from the free end. The load must be applied at right angles to the center line of the mast arm and in the same vertical plane. The deflection must not be greater than 3". Within one (1) minute after the test load is released, measurement must be made of the set taken by the mast arm. This set must not be greater than 0.5". 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 ±5%. No measurable set must be noted within one (1) minute after test load is released. The mast arm must then be checked to insure that it is still securely fastened, that it is plumb, and that no cracks have developed in either the mast arm or attachment plate.

(f) Weld tests for both the arm and the scroll as described in the WELDING Section of this Specification.

(g) Acceptance of Equipment. Tests must be made on 5% of all mast arms and scrolls in the order. If any of the mast arms or scrolls fail to meet these specifications, an additional three mast arms or scrolls must be tested for each failed unit. Should any of these additional units fail to meet these specifications, the entire lot will be subject to rejection. The Commissioner will then decide, based on the nature of the failure, whether the entire lot will be rejected outright or whether the manufacturer may subject each mast arm or scroll in the order to testing. If each mast arm or scroll in the order is tested, those mast arms or scrolls which fulfill the specified requirements may be accepted at the discretion of the Commissioner.

PACKAGING

11. (a) General. The mast arms and scrolls must be carefully inspected at the factory prior to shipment to assure that the mast arms and scrolls are complete and free of defects. When mast arms are stacked together, they must be supported with suitable spacers or must otherwise be protected from dents and other potential shipping damage. The spacing and protective materials must be suitable for and usable in the storage of the mast arms. The same requirements apply to the scrolls. All hardware must be packaged in a clear container and labeled.

(b) Packaging. The mast arms and scrolls must be shipped in bundles weighing a maximum of 1,000 pounds. Mast arms and scrolls must be in separate bundles. Each mast arm or scroll must be individually wrapped and protected so that it can be bundled and unbundled without damage to the unit or its finish. The wrapping must be clearly marked to identify the arms and scrolls. Specific instructions must be securely attached to each bundle indicating the proper methods of storage. In addition, each bundle must contain specific instructions on unbundling and erection of the mast arms or scrolls. Instructions must be printed on a fiber based paper with a permanent ink so that instructions will be completely legible after weathering outdoors for a minimum of 5 years.

(c) Bundles. The bundles must consist of arms or scrolls laid to form an approximately rectangular cylinder. Arms and scrolls must be packaged in separate bundles. 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. Bundling procedure will be subject to approval. Any bundles, in which either mast arms, scrolls 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 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.

(d) Appurtenant Devices and Hardware. Any appurtenant devices and hardware not attached to the mast arm or scroll must be carefully wrapped and securely attached to each bundle. All device and hardware containers must be clearly labeled as to the contents. Labels must identify the quantity of parts and their relationship to the arms or scrolls. Payment will be withheld for any units provided without the appropriate appurtenant devices and hardware. Cracked, broken, chipped or damaged units will be considered as incomplete quantities as regards payment. Improperly labeled units will also be considered as incomplete.

(e) Touch-up Paint. Touch-up paint and appurtenant materials must be packaged in units sufficient for twenty 20 mast arms and 20 scrolls. These units will be securely attached to a sufficient number of bundles to fulfill the touch-up paint requirements stated herein.

ELECTRICAL SPECIFICATION 1518
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED FEBRUARY 13, 2014

INTERNALLY ILLUMINATED SIGN, LED

SUBJECT

1. This specification states the requirements for an internally illuminated sign using an LED (light emitting diode) light source. The sign will display a symbolic turn prohibition "NO LEFT TURN" or "NO RIGHT TURN", or a symbolic ADO NOT ENTER message. The sign will be legible at all times it is energized. If the sign is not energized the display message will not be visible.

GENERAL

2. (a) Specifications. The illuminated sign must conform in detail to the requirements herein stated, to the specifications of the Federal Highway Administration's Manual on Uniform Traffic Control Devices (MUTCD), and to the applicable paragraphs of Article 1084.01 of the Illinois Department of Transportation's Standard Specifications for Road and bridge Construction (Standard Specifications).

(b) Standards. Equipment furnished under this specification shall meet the appropriate requirements of the following standards organizations:

Illinois Department of Transportation Standard Specifications for Road and Bridge Construction (Standard Specifications)
Institute of Transportation Engineers (ITE)

(c) Acceptance. Illuminated signs not conforming to this specification will not be accepted.

(d) Warranty. The manufacturer must warrant the signs against defective design, material, and workmanship for a period of 3 years from date of delivery [date of final acceptance for contract construction]. The LED modules must carry a 7 year warranty against failure or loss of color (chromaticity) and signal brightness (luminance) below minimum acceptable ITE standards from the date of delivery [from the date of final acceptance for contract construction]. In the event of defects or failure during this period, the manufacturer must

repair or replace such defects or failures 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 of final delivery.

(e) Bidders Drawings. Bidders must submit with their bids detailed scale drawings of the illuminated sign proposed to be used. The drawings must show every dimension necessary to indicate how parts will fit each other and be properly held in assembly.

(f) Sample. One complete illuminated sign assembly of the manufacture intended to be furnished must be submitted within 15 business days upon request of the Chief Procurement Officer.

DETAILED REQUIREMENTS

3. (a) Housing. The case must be formed from extruded aluminum alloy at least 0.125 inch thick. The case must be primed inside and out with one coat of zinc primer. The inside must be white enamel. The outside must be painted with two coats of baked on enamel of a matte black finish. The case will be furnished with 1.5 inch hubs, top and bottom. Doors must have a 6 inch aluminum sun hood. Door gaskets must be neoprene and must provide a weatherproof seal. All nuts and bolts are to be 18-8 stainless steel.

(b) Sign Display. The sign display must be fabricated of material meeting the requirements of Article 1084 of the Standard Specifications. The face must be held in place by a formed aluminum channel. The display must contain the symbolic message for ANO LEFT TURN@, ANO RIGHT TURN@, or ADO NOT ENTER@. Colors and size of the message and background must conform to the MUTCD.

(c) Illumination. The sign must consist of standard T-13/4 (5 mm) LED lamps and have an expected lamp life of 100,000 hours. Operating wavelengths and luminance must meet the requirements of Standard Specification 1084. Transformer must be rated for the line voltage with Class A rating insulation and weatherproofing. The sign must be designated for operation over a range of temperatures from -401 F. to +1651 F. (-401 C. to +741 C.).

(d) Legibility. The sign must be legible 24 hours a day or only for specific time periods depending upon the requirements for the internally illuminated sign. Signs that are legible for specific time periods must be switched on and off from the traffic controller.

PACKAGING

4. (a) General. The signs must be shipped fully assembled and ready for installation. Each assembly must be individually wrapped and boxed so that the assembly is not damaged in shipment.

(b) Labeling. Each box must be labeled in 3/8 inch high letters ALED ILLUMINATED SIGN@ ; the message also should be in 3/8 inch high letters. The City Commodity Code, contract number, manufacturer, and date of manufacture must be clearly labeled on the box.

ELECTRICAL SPECIFICATION 1528
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED JUNE 6, 2014

PRECAST CONCRETE STRUCTURES

SUBJECT

1. This specification covers the requirements for precast concrete structures to be used for City of Chicago electrical facilities. The structures will include manholes, handholes, and street light pole foundations.

GENERAL

2. (a) Specifications. The precast structures must 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. Precast structures not conforming to this specification will not be accepted. The Commissioner of Transportation or his representative will be the sole judge in determining if the precast structures meet this specification. The Commissioner's decision will be final.

(c) Drawings. The drawings mentioned herein are drawings of the Department of Transportation. They are integral parts of this specification cooperating to state necessary requirements.

(d) Bidders Drawings. The apparent low bidder must submit detailed scale drawings of the precast structures showing actual dimensions and details, if so requested. Shop drawings must be original engineering drawings created by the manufacturer. The drawings must give every dimension necessary and show how the structure is assembled.

(e) Sample. One complete precast structure of each item must be submitted within fifteen (15) business days upon request of the Chief Procurement Officer.

(f) Warranty. The manufacturer must warrant the performance and construction of the precast structures to meet the requirements of this specification and must warrant all parts, components, and appurtenances against defects due to

design, workmanship, or material developing within a period of one (1) year after the precast structures have been delivered. This will be interpreted particularly to mean structural failure of any element. 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. The Commissioner's decision will be final.

DESIGN

3. (a) Material. Concrete must be Portland cement concrete, Class SI or PC, meeting current IDOT specifications. Pulling irons in manholes must meet or exceed the requirements of ASTM A36 steel. Pulling irons must be hot dipped galvanized. Steel reinforcing bars must meet or exceed the requirements of ASTM A615, Grade 60. Cable supports in manholes, including stanchions and racks, must be manufactured for that specific purpose. Stanchions must be non-metallic and must be capable of accommodating several different sizes of cable hooks at various elevations. A minimum of eight cable hooks, 4 inches in length, must be provided with each manhole, and should include any hardware necessary to affix the hooks to the racks. Cable hooks for handholes must be manufactured for that specific purpose. Cable hooks for handholes must be a minimum of 3 inches in length and 3 inches in depth. Anchor rods in foundations must meet the latest Electrical Material Specification 1467. Conduit elbows in foundations must meet the latest Electrical Material Specification 1462.

(b) Foundations must include conduit elbows, anchor rods, washers, and nuts. The 7 foot foundation must include a 6 foot re-bar cage. Handholes must include cable hooks. Manholes must include cable racks, pulling irons, and cable hooks. Each manhole and each handhole must have lifting anchors cast in the concrete to facilitate shipment and installation. If the manhole or handhole is in more than one piece, instructions for assembly must be provided. Also, a sufficient amount of bonding agent must be provided. The bonding agent must be approved material. Frames and covers, sump grates, clay tile, and ground rods are not included under this specification.

(c) Dimensions of Manholes and Handholes. Each manhole or handhole must be dimensioned as shown on the appropriate standard drawing. The 30 inch diameter handhole is Standard Drawing 867. The 36 inch diameter handhole for 24 inch frame and cover is Standard Drawing 866. The 36 inch diameter for 30 inch for frame and cover is Standard Drawing 871. The 3 foot by 4 foot by 4 foot manhole for a 24 inch diameter frame and cover is Standard Drawing 730. The 3 foot by 4 foot by 4 foot manhole for 30 inch frame and cover is Standard Drawing 729. The 4 foot by 6 foot by 6 foot manhole for 24 inch frame and cover is Standard Drawing 732. The four foot by 6 foot by 6 foot manhole for 30 inch frame and cover is Standard Drawing 733. The 5

foot 4 inch by 7 foot 4 inch manhole roof is Standard Drawing 733.

(c) Dimensions of Grade Rings. Grade rings shall be in four different dimensions. The 39 inch outside diameter ring shall have a 24 inch diameter opening and shall come in both 2 inch and 4 inch thicknesses. The 45 inch outside diameter ring shall have a 30 inch diameter opening and shall also come in both 2 inch and 4 inch thicknesses.

(d) Dimensions of foundations. The residential street light foundation shall be dimensioned as shown on standard drawing 565. The 7 foot arterial street light foundation shall be as shown on standard drawing 818.

DELIVERY

4. All manholes, handholes, and foundations will be delivered to the Division of Electrical Operations storage yard at 1539 South Ashland Avenue in Chicago, or to another location within the City as indicated on the order. Any manhole, handhole, or foundation deemed to be defective by the Commissioner or his representative must be removed and replaced at no cost to the City. The Commissioner?s decision will be final.

ELECTRICAL SPECIFICATION 1533
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED FEBRUARY 24, 2023

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 352. 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 D3350 and NEMA TC7.

(c) A tape must be installed in the HDPE conduit at the factory. The tape is for pulling cable through the conduit. The tape must be specifically manufactured for this purpose. The tape must have a tensile strength of at least 1000 pounds.

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: ½, ¾, 1, 1 ¼, 1 ½, 2, 2 ½, 3, 3 ½, 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.

ELECTRICAL SPECIFICATION 1534
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED AUGUST 5, 2013

CABLE: SINGLE-CONDUCTOR, COPPER 600 VOLT

SUBJECT

1. This specification states the requirements for single conductor cables intended to be used in 240 VAC street lighting circuits. The cable will also be used as service cable for both street light controllers and traffic signal controllers. The cables will be installed in underground conduit and rated as 600 volt.

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) ASTM – American Society for Testing and Materials
   (2) ICEA – Insulated Cable Engineers Association
   (3) IEEE – Institute of Electrical and Electronics Engineers
   (4) UL – Underwriters Laboratories

   (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.

CABLES

3. (a) Construction. The cable must consist of an uncoated multiple strand copper conductor with a tight fitting thermoset, free stripping, concentric layer of ethylene propylene (EPR) insulation.

(b) The number of strands and the outer diameter of the cable shall be as noted in TABLE A.

(c) Cable shall be UL approved for sunlight resistance and for direct burial applications.

(d) Cable must meet IEEE 383 and UL 1581 70,000 BTUs per hour flame test requirements.

COLOR CODE

4. (a) Triplexed cable shall consist of a black cable, a red cable, and a green ground cable. Triplexed cable will have a 16" to 18" lay.

(b) Individual cables will be black, red, or white, depending upon the order.

CONDUCTOR

5. (a) Material. The conductors must be soft round copper strands.

(b) Specifications. The conductor must meet the requirements of ASTM B3 and ASTM B8.

(c) Sizes. The conductor sizes must be 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

6. (a) Type. The insulation must be ethylene propylene rubber compound (EPR) meeting the requirements of ICEA S-95-658 and UL 44 for RHW-2 cable and UL 854 for USE-2 cable.

(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) 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-RHW-2

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.

TESTING

7. (a) Initial Physical Requirements.

1. Tensile strength, minimum, p.s.i.	1200
2. Elongation at rupture, minimum %	250

(b) 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:

1. Tensile strength, minimum % of initial value	75
2. Elongation at rupture, minimum percent of initial value	75

(c) Water Absorption Test. Gravimetric method: After 168 hours in water at 70±1°C water absorption, at a maximum – 5 milligrams per square inch

(d) Cold Bend Test. The completed cable must pass the test requirements of ASTM D 470, except that the test temperature must be -25°C.

(e) Electrical Tests.

1. Voltage. 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 ohms when tested in accordance with ASTM D 470.

(f) Flame Tests. Cable must pass a 70,000 BTU flame test in accordance with IEEE 383.

(g) All of the above tests must be on cable produced for the order. Tests must be taken on samples taken every 25,000 feet, or fraction thereof, of each conductor size.

(h) Test Reports. No cable shall be shipped until certified copies of all factory tests have been reviewed and approved by the City. Cable that does not pass any one of the above tests will be rejected.

PACKAGING

8. (a) 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. 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 in Table A of this specification. Alternate lengths may be considered.

(c) 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, the appropriate City commodity code if applicable, and a description of the cable. Also, each reel must have permanent marking on it indicating 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		INSULATION THICKNESS	A-C TEST	REEL LENGTH	OVERALL DIAMETER
AWG	STRANDS	MILS	VOLTS	FEET	INCH
14	7	45	5500	2000	.133
12	7	45	5500	2000	.152
10	7	45	5500	2000	.176
8	7	60	5500	2000	.236
6	7	60	5500	2000	.274
4	7	60	5500	2000	.322
2	7	60	5500	1000	.382
1/0	19	80	7000	1000	.470
2/0	19	80	7000	1000	.514
3/0	19	80	7000	1000	.564
4/0	19	80	7000	1000	.620
250 MCM	37	95	8000	1000	.705

ELECTRICAL SPECIFICATION 1537
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED AUGUST 5, 2013

CABLE: TRAFFIC SIGNAL, MULTIPLE CONDUCTOR, COPPER WIRE, 600 VOLT

SUBJECT

1. This specification states the requirements for a multiple conductor cable to be installed in underground conduits and used to distribute electrical energy to operate automatic traffic control signals for both vehicular and pedestrian traffic 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. The cable will be rated as 600 volt.

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 lieu of other claims against them, if the cable is 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.

CABLES

3. (a) Construction. The cable must consist of coated conductors each concentrically encased with a free- stripping, thermoset cross-linked polyethylene insulation. Suitable fillers must be used to produce an essentially round cross-section. A Mylar tape must be wrapped over the conductor assembly, and a thermoset low smoke zero halogen polyolefin (LSZH) jacket applied overall.

(b) Outer Diameter. The maximum allowable outer diameter for round cables must be as follows:

No. Of Conductors	Outer Diameter (inches)
Ten	0.69
Nineteen	0.90

(c) Cable shall be UL approved for sunlight resistance and for direct burial applications.

(d) Cable must meet IEEE 383 and UL 1581 and UL1202 70,000 BTUs per hour flame test requirements.

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. Solid, soft or annealed, tinned copper wire, meeting the requirements of ASTM B-33 and B-258.

(b) Size. Cables must be made up of conductor sizes as set forth in this specification. The Number 14 AWG will be solid.

INSULATION

6. (a) Type. The insulation must be a thermoset cross-linked polyethylene compound meeting the requirements of ICEA S-73-532 and UL 44 for XHHW-2 cable.

(b) Thickness. The insulation must be circular in cross-section and have the following minimum thicknesses.

Conductor Size. AWG	stranding (No. Of Wires)	No. of Conductors	Insulation Thickness (mils)
#14	1	10	30
#14	1	19	30

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 a thermoset low smoke zero halogen (LSZH) polyolefin.

(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. Thickness of the jacket must be 4/64 inches. Minimum thickness must be not less than ninety percent (90%) of the average thickness.

(d) 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. The jacket must be black.

TESTING

9. (a) Initial Physical Properties of Insulation.

1. Tensile Strength, minimum 1200psi
2. Elongation at Rupture, minimum 250%

(b) Physical Properties of Insulation After Aging. After 168 hours in air oven at 121° C.

1. Tensile Strength 75% of initial value

2. Elongation 75% of initial value

(c) Initial Physical Properties of Jacket.

1. Tensile Strength, minimum 1800psi
2. Elongation at Rupture, minimum 300%

(d) Physical Properties of Jacket After Aging. After 168 hours in air oven at 121° C.

1. Tensile Strength 75% of initial value
2. Elongation 65% of initial value

(e) Water Absorption. Tests must be made in accordance with ASTM D 470. After 168 hours in distilled water at 70° C., water absorption of the insulation material must not exceed 5 milligrams of water per square inch. For the jacket material the water absorption must not exceed 1 milligram per square inch under the same conditions.

(f) Cold-Bend Test. The completed cable must pass cold bend test of ASTM D 470, except that the test temperature must be minus(-)25°C.

(g) Electrical Requirements.

1. Voltage. 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 of not less than 20,000 ohms when tested in accordance with methods in ASTM D 470.

(h) Flame Tests. Cable must pass a 70,000 BTU flame test in accordance with IEEE 383.

(i) Tests. The above tests must be performed on the insulation, the jacket, and the completed cable as required above. Tests must be performed on samples taken every 25,000 feet or fraction thereof of each cable size.

(j) Reports. No cable will be accepted until certified copies of the test reports have been reviewed and approved by the City. Cable that does not pass any of the above tests will be rejected.

PACKAGING

10. (a) 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. 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.

(1) Ten-Conductor	2000 feet
(2) 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 if applicable, 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.

TABLE A COLOR CODE CONDUCTOR IDENTIFICATION

Base Color	First Tracer	Second Tracer	10	19
White	Black	Red	--	14
White	Red	Green	--	14
Black	--	--	14	14
White	--	--	14	14
Red	--	--	14	14
Green	--	--	14	14
Orange	--	--	14	14
Blue	--	--	14	14
White	Black	--	--	--
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

ELECTRICAL SPECIFICATION 1541
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
SEPTEMBER 16, 2004

REINFORCING ROD FORMED STEEL CAGES

SUBJECT

1. This specification is for steel cages. The cages are to be used in street light pole foundations to provide the necessary strength to support street light poles.

DESCRIPTION

2. (a) The steel must conform to the requirements of the American Society for Testing and Materials cited by ASTM designation number, of which the latest revision will govern.

(b) The steel cages must conform to all the requirements shown on Electrical Standard Drawing 793A.

(c) The steel cages must be constructed of number 3 and number 6 reinforcing bars, as shown on Electrical Standard Drawing 793A. Reinforcing steel must conform to ASTM A615, Grade 60, with a yield strength of 60,000 psi. All joints must be welded according to the latest recommendations of the American Welding Society's (AWS) Document 1.4.

ACCEPTANCE

3. If so requested, a sample cage must be delivered to the City within fifteen (15) business days of such request by the Chief Procurement Officer. The contractor must present certification that the steel used meets this specification. The City reserves the right to reject any cages which do not completely meet this specification.

DELIVERY

4. The Contractor must furnish and deliver the steel cages to the City of Chicago, Department of Transportation, Division of Electrical Operations, 4101 South Cicero Avenue, Chicago, Illinois 60650, or to a location as directed in the contract. Any cages that do not meet the specification or are delivered damaged will be rejected.

ELECTRICAL SPECIFICATION 1545
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED FEBTRUARY 7, 2014

PEDESTRIAN COUNTDOWN TRAFFIC SIGNAL LED, 16 INCH WITH SYMBOLIC WALK/DON'T WALK, POLYCARBONATE HOUSING

SUBJECT

1. This specification states the requirements for a single section pedestrian countdown signal with light emitting diode (LED) symbolic messages on a nominal sixteen inch by eighteen inch message surface and enclosed in a polycarbonate housing.

GENERAL REQUIREMENTS

2. (a) Sample and Certified Test Reports. One complete pedestrian countdown signal, fully assembled and wired, of the manufacture proposed to be furnished, must be submitted along with the required certified test reports, within 15 business days upon request of the Chief Procurement Officer. The sample must be delivered to the Division of Electrical Operations, 2451 South Ashland Avenue, Chicago, Illinois 60608.

(b) 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 Iron and Steel Institute (AISI)
American Society for Testing and Materials (ASTM)
Institute of Transportation Engineers (ITE)
National Electrical Manufacturers Association (NEMA)
Underwriters Laboratories (UL)

(c) Approval. Approval will mean approval in writing by the Commissioner or his duly authorized representative.

MATERIAL AND EQUIPMENT REQUIREMENTS

3. (a) The pedestrian signal heads must conform to ITE Standard "Pedestrian Traffic Control Signal Indications" (PTCSI), in which the most recently published revision will govern.

(b) Housing Design. The housing must be one piece, ultra violet stabilized polycarbonate resin of the specified color, injection molded complete with integral top, bottom, and sides, having a minimum thickness of 0.1 inches.

The polycarbonate formulation used must provide these physical properties in the housing (Tests may be performed on separately molded specimens).

TEST	REQUIRED	METHOD
Specific gravity	1.17 minimum	ASTM D 792
Vicat Softening temp	310-320º F	ASTM D 1525
Brittleness temp.	-200º F	ASTM D 746
FlammabilitySelf-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, .125" thick)	12-16 ft. lbs./in.	ASTM D 256
Fatigue strength (at 2.5 mm cycles)	950 PSI min.	ASTM D 671

(c) 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 5˚ increments to eliminate undesirable rotation or misalignment of the signal head between sections. A total of 72 teeth must be provided in the serrated bosses to allow the signal face to be rotated 360˚ about its axis. The teeth shall be clean and sharp to provide positive positioning with the grooves of the mating section or framework. Each opening must accommodate standard 1.5 inch pipe fittings and brackets.

(d) Hinges. The housing must have 4 integral hinge lugs, with stainless steel hinge pins (AISI 304 or equivalent), located on the left side for mounting the door. The hinge pins must be straight and not protrude past the outside of the housing lugs. The housing must have 2 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.

(e) Door. The door must be a one piece ultraviolet stabilized polycarbonate resin

of the specified color, injection molded complete with a minimum thickness of 0.1 inch. Two hinge lugs on the left side and 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 2 stainless steel hinge pins, drive fitted. Two stainless steel latch screws and wing nuts and washer assemblies on the latch side of the housing body must provide for opening and closing the door without the use of tools.

The inside of the door must be grooved to accommodate a one piece, air-cored ethylene propylene diene monomer(EPDM) gasket to provide a weatherproof and dust proof seal when the door is closed. The outside of the door must have an integral rim completely encircling the opening to prevent leakage between the door and the LED module. The rim must have equally spaced tabs around the circumference with threaded metal inserts for the visor attachment.

(f) Gaskets. Wherever necessary to make a completely dust-proof, moisture-proof and weatherproof assembly of the housing and optical system, approved type gaskets of neoprene or silicone rubber shall be provided.

LED OPTICAL MODULES

4. (a) Light emitting diode (LED) optical modules must 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 colors, and electronic and electrical components necessary to permit operation at nominal 120 volt, 60 hertz power. All units shall form a neat compact unit within the housing body with no light leakage between the door and the housing body.

(b) The LED unit shall meet the applicable requirements of ITE's LED Pedestrian Traffic Control Modules. During the required operating life of LED signal units, the luminance output of the units must not be less than 60% of the values specified in the standard.

(c) LED module power supply must be constant current regulated and filtered to provide instant on indications, and to prevent momentary signal outages or flicker.

(d) Modules shall consist of LEDs uniformly distributed to present a homogeneous appearance on the face of the lens from a wide viewing angle.

(e) 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.

(f) 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 2 or more series strings of LEDs or in excess of 20% of LEDs are not operable.

(g) LED modules must be fully operable over a range of 90 volts to 130 volts at 60 hertz ± 3 hertz.

(h) Surge protection. Each unit must be provided with integral surge protection to withstand a 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.

(i) Maximum permissible power consumption at ambient conditions (nominal 120 volts, 60 hertz, 70˚F.) must be 18 watts at a minimum 90% power factor. Power consumed must not vary by more than 10% from nominal power consumption over a voltage range of 105 volts to 125 volts, and over permissible environmental ranges.

(j) Modules must be fully operable at temperature ranges of -40˚F. (-40˚C.) to +165˚F. (+74˚C.) at up to 100% relative humidity.

(k) Modules 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, and signal serial number.

(l) The LED module shall be compatible with all 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.

(m) Modules shall meet applicable sections of Title 47, Sub-Part B, Section 15 of the Federal Communications Commission (FCC) rules as applies to electronic noise limitation and electromagnetic interference.

(n) Total harmonic distortion (THD) induced into the voltage and current AC power line sine waves must not exceed 20%.

(o) Burn-in. LED Optical modules must be energized for a minimum 24 hour

burn-in at 100% on-time duty cycle.

DISPLAY

5. (a) The message area shall be approximately 16 inches square and display the double overlay "Don't Walk" and "Walk" symbols immediately adjacent to the countdown digits. The symbols shall be applied in such a manner as to provide an opaque polycarbonate background and illuminated legends.

(b) Symbolic Messages. Symbols for "Walk" (Man) and "Don't Walk" (Hand) must conform in style and color to those of ITE. The symbols must not be less than 9.5 inches high with proportional width. The "Don't Walk" symbol must be Portland orange, and the "Walk" symbol must be of lunar white, conforming to the specifications of the ITE/PTCSI.

(c) Countdown Digits. Countdown digits must be Portland orange and not less than 9 inches high with proportional width and shall be compliant with latest ITE standards.

(d) The module message surface shall be constructed of ultraviolet (UV) stabilized, impact resistant polycarbonate, acrylic or other approved material. The surface must be anti-glare, smooth texture, and clear.

WIRING

6. (a) Wire Leads. Each module connector must be furnished with 3 wire leads color coded as follows:

White	-	Common
Red	-	"Don't Walk" Indication
Green	-	"Walk" Indication

The leads must be No.18 AWG, stranded copper wire rated at 600 volt and 105˚C., with thermoplastic insulation. The ends of the leads must be stripped of 0.5 inches of insulation and tinned. The leads must be splice-free and connected to one side of the terminal strip.

(b) Terminal Strip. A four terminal, eight point, barrier type terminal strip with solid base and pressure plate type connectors must be securely attached at each end to the housing body inside the walk section.

(c) Cable. One 11 foot length of flexible electric cord, medium duty, type SO, 3-conductor No. 16 AWG stranded copper, with color coded insulation, and an overall jacket, must be furnished with each pedestrian signal. Both ends of each cable length must be carefully stripped of 6 inches of jacket and 1inch

of insulation, and each conductor properly tinned.

COUNTDOWN FUNCTIONALITY

7. (a) The countdown unit shall be compatible with all traffic signal controller equipment currently in use by the City of Chicago, and meeting the City=s latest specifications for traffic signal control equipment.

(b) The countdown timer must have a micro-processor capable of recording its own time when connected to a traffic controller.

(c) The countdown timer unit must continuously monitor the traffic controller for any changes to the pedestrian phase time and re-program itself automatically as needed.

(d) The countdown unit must register the time for the walk and clearance intervals individually and must begin counting down at the beginning of the pedestrian change interval (flashing hand).

(e) At the end of the pedestrian change interval, the unit must display A0" and the blank out. The display must remain dark until the beginning of the next countdown.

(f) In the event of a preemption sequence, the countdown unit must skip the pre-empted clearance time and reach “0” at the end of the pedestrian change interval.

(g) The countdown must remain synchronized with signal indications and always reach A0" at the end of the pedestrian change interval.

(h) The countdown must not display an erroneous or conflicting time when subjected to defective load switches.

TESTING AND DOCUMENTATION REQUIREMENTS

8. (a) 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 modules shall be tested by a nationally recognized testing laboratory (NRTL), such as Intertek (ETL division), to demonstrate compliance with the latest ITE VTCSH specification. All LED modules shall have the testing laboratory’s label attached.

(b) Inspection. The signals will be subject to inspection at the discretion of the Commissioner. Final inspection shall be made at point of delivery. Any

signal rejected must be removed, disposed of, and replaced by the contractor at his sole cost.

(c) Warranty. The manufacturer shall warrant the signals 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 3 years from date of delivery [date of acceptance for contract construction]. In addition, LED optical modules must carry a 7 year warranty against failure or loss of color (chromaticity) and signal brightness (luminance) below minimum acceptable PTCSI standard levels from date of delivery [date of acceptance for contract construction]. In the event defects and failures occur in the LED units during the warranty period, the manufacturer must replace such 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.

PACKAGING

9. (a) Packing. Each pedestrian signal assembly shall be packed in a suitable carton so secured that the signal will not be damaged during shipment, handling or storage.

(b) Marking. Each carton containing a pedestrian signal shall be clearly marked on the outside in letters not less than 3/8 inch tall with the legend: "PEDESTRIAN SIGNAL, COUNTDOWN, SIXTEEN-INCH, SYMBOLIC LED WALK-DON'T WALK@, the name of the manufacturer, the date of manufacture, the pertinent Contract Number and the appropriate City Commodity Code Number.

ELECTRICAL SPECIFICATION 1560
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED JANUARY 14, 2021

NEMA TS2-2 SUPER P CABINET WITH ADVANCED TRANSPORTATION CONTROLLER AND UNINTERRUPTIBLE POWER SUPPLY

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1. GENERAL REQUIREMENTS

1.1 This specification details the requirements for traffic signal control equipment for use in the City of Chicago. This equipment shall control traffic signal timing and sequencing at an intersection. The equipment shall include a battery back-up system which will maintain power to the signals during a power failure.

1.2 (For contract construction only) If requested by the City, the contractor shall provide a sample to the Division of Electrical Operations, 2451 South Ashland Avenue, Chicago, Illinois 60608. The sample shall 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 to these specifications will be based on the sample submitted.

(For City commodity contract only) If requested by the Chief Procurement Officer, within thirty (30) days from the receipt of such request, the bidder shall provide a sample to the Division of Electrical Operations, 2451 South Ashland Avenue, Chicago, Illinois 60608. The sample shall consist of the controller, cabinet, load switches, conflict monitor and all appurtenant wiring and equipment completely assembled as a working unit. If the sample is acceptable and the bidder is awarded a contract, the sample will become the property of the City of Chicago with a suitable credit issued to the contract.

1.3 All tests as outlined herein shall be regarded as minimum requirements. The contractor shall submit his testing procedure for approval prior to performing any testing functions. Upon successful completion of all testing, certified test reports shall be submitted for each unit. Units not successfully passing these tests or lacking proper documentation will be rejected. The manufacturer, or manufacturer's representative, must be available for shop testing at the City's facilities.

1.4 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 (AASTHO)
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 Electrical Standard Drawing 962 "Load Switch and Conflict Assignment", Electrical Standard Drawing 964 "Traffic Controller Cabinet Back Panel and Power Supply, 1 of 2", and Electrical Standard Drawing 965 "Traffic Controller Cabinet Back Panel and Power Supply, 2 of 2" are integral parts of this specification.

1.6 Warranty. The manufacturer(s) shall warranty the performance and construction of the traffic signal controller and other major components 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 acceptance by the City. In the event of defects or failures during this period, the manufacturer(s) must repair and/or replace all defective or failed parts or appurtenances at no expense to the City.

1.7 Manufacturer. The manufacturer of the cabinet and controller and the manufacturer of the battery back-up system must demonstrate a knowledge of past production, or have been actively engaged in the sale and/or service of the equipment herein described, as demonstrated by a submitted list of comparable projects.

2. CONTROLLER REQUIREMENTS

2.1 ATC. The controller shall be an Advanced Transportation Controller (ATC) meeting the requirements of the specification "Advanced Transportation Controller (ATC) Standard Version 5.2b" dated June 26, 2006 and the requirements of NEMA TS2-2003. The referenced ATC 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 shall meet the programming modifications and options listed in the ATC Matrix as indicated in Table A. All software necessary to make the controller operational shall be included.

2.2 Power. The controller shall operate on 120 volt, 60 cycle (± 3 Hertz), single phase, alternating current. The controller shalll function in the range from 89 to 135 Volts a.c. The power consumed must be under 50VA.

2.3 Packing. (For City commodity contracts only) Each controller, with all its component parts, shall 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, shall be furnished to the Division of Electrical Operations for approval prior to the first shipment of controllers. All information, including photos and schematics, shall 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. If requested, the contractor shall 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 the instructions in a teaching-type format). Training shall be structured for both field personnel and shop personnel. The manufacturer shall provide all material and equipment necessary for the training.

2.6 Chassis. The chassis shall be aluminum with a 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, so that retrofitting will not be a problem. 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 - 32MB Flash
DRAM - 64MB
SRAM - 1MB
(All memory and firmware must be stored in flash memory. No EPROMS will be allowed.)

2.8 Display. The display shall be a 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 shall operate in the temperature range of -34˚ Celsius to +74˚ Celsius. The controller shall operate within the relative humidity of 5% to 95%.

2.10 All printed circuit boards shall 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/contract must not be used in the design of any subassemblies provided under this contract.

2.13 The controller shall 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 shall 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 4 (C50S) must be a 9-pin connector with only limited signals being required.

Special function connector for the TS2-2 shall 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
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 shall 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 shall 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 shall 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
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 shall 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
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
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
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 shall be compliant with NTCIP Standards as outlined in NEMA TS2 – 2003 and must be tested and documented for compliance.

b. Global objects shall be compliant to NTCIP 1201 v2.26 or later.

c. Actuated Signal Controller objects shall 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 traffic signal management system. All available functions and capabilities that exist within existing controllers must be available within this unit, as well as compatible with the ATC LMD40 unit and the ATC NEMA unit. Any additional software or hardware necessary to fully integrate the controller into the City's traffic signal management system must be provided by the bidder/contractor and will be considered as part of the requirements of this specification.

(7) Windows based laptop utility software must be provided for data transfers and monitoring of controller operation.

(8) A fiber-optic modem shall 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 shall 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 hardwire input, it shall be possible to set Absolute Zero via keyboard command or fiber optic communication.

(3) The controller shall have the ability to operate in two modes of operation, selectable by time of day:

a. Actuated control per NEMA TS2 – 2003.

b. Pre-timed Interval based control per NEMA TS2 – 2003.

(4) The controller shall 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 64 circuit outputs. Each output must be individually programmable per interval.

(6) The controller shall have 100 coordination plans.

(7) The controller shall provide 6 preempts per NEMA TS2-2003.

(8) The controller shall 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 must not be possible to read the security code from the controller's display.

c. It must 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.

3. CONFLICT MONITOR

3.1 General. Each controller shall be furnished with a NEMA conflict monitor unit for checking for conflicts in the signal output circuits. The conflict monitor shall 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 shall 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 shall 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 shall 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 shall 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 shall 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 shall 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 shall 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 shall 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 shall be provided for the red enable feature.

(5) A terminal shall be provided for the hook up of any unused red channels to AC.

(6) Controller monitoring shall consist of; voltage monitor, 24VDC- I, 24VDC-II.

(7) The output relay shall operate a sixty (60) ampere, normally open, “A” type contactor without the use of an external or “cabinet interface” relay.

4. SUPER P CABINET

4.1 Housing. Each controller shall be furnished completely housed in a Type 5052-H32 aluminum housing of 0.125 inch thickness. The exterior dimensions of the cabinet shall be approximately 57 inches high, 58 inches wide, and 27 inches deep. The top of the cabinet shall be approximately 58 inches wide and 29 inches deep. The top of the cabinet must have a front to rear slope that will direct rain away from the front cabinet door. Door openings must be double-flanged. The interior of the cabinet will be divided into two compartments. The interior of the main cabinet shall be equipped with four (4) "C" mounting channels on both side walls and two (2) "C" mounting channels on the rear wall. The UPS portion of the cabinet shall be equipped with two (2) "C" mounting channels on each of the two side walls. 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.

4.2 Doors. The cabinet shall have a main door hinged with one-quarter inch (1/4") minimum, continuous, removable stainless steel pins. The hinges themselves will be aluminum secured to the cabinet with stainless steel bolts. The battery compartment door on the side of the cabinet must be similarly hinged. The main cabinet door will be hinged on the right side. The battery compartment door will be hinged on the left side. 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.

Opening of the main door must provide complete access to the cabinet interior. The door shall be embossed, subject to approval, with the legend "CITY OF CHICAGO-TRAFFIC CONTROL" in letters at least one (1) inch high. The main door and the battery compartment door must have stops at 90, 150 and 180 degrees, from the closed position. The door latches 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 keys to match existing City of Chicago controller cabinets. Two (2) keys must be furnished with each cabinet. Both the main door and the battery compartment door will have stainless steel handles with an 8" shank. The handles must be able to be padlocked. The padlocking arrangement must clear the lock and key.

Police Panel Door. The police panel door on the main door shall be furnished with a lock for a modified Chicago police key per sample to be furnished to the supplier. 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. The door will have a stainless steel piano hinge and be sealed with a neoprene

gasket.

Generator Door. This door will be on the rear of the cabinet. This door will have a stainless steel piano hinge and be sealed with a neoprene gasket. Two keys will be furnished for this door.

4.3 Cabinet Ventilation. The main cabinet compartment shall be provided with a mounting assembly to hold the forced air fan system. A fan, having a minimum air movement capacity of 100 CFM, shall 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 battery compartment shall have a similar fan system. The battery compartment door must also have a louvered section with a removable 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 Shelves. The cabinet shall contain a vertically adjustable shelf large enough to accept the solid state controller and all other shelf mounted devices. The battery compartment shall have a minimum of three shelves.

4.5 Bolt Pattern. The bolt pattern shall be a four (4) point rectangular pattern matching the corresponding foundation. The dimensions will be 40.75" center-to-center and 18.5" center-to-center.

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 #17038 for gloss black. 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 shall be inserted in series with the line.

5.2 An un-fused terminal bus shall be provided for ground side of the power supply and signal conductor commons.

5.3 Individual circuit breakers shall be supplied for: (a) AC+ lights, 50 amperes; (b) AC+ control, 10 amperes; (c) duplex outlet supply, 15 amperes.

5.4 The incoming line shall contain lightning protection devices consisting of, but not limited to, a metal oxide varistor and gas type arrestor. The gas type arrestor must be on the line side of the radio interference filter.

5.5 Contactor**.** A sixty (60) ampere, normally open, "A" type contactor shall be supplied for opening and closing the AC supply to the signal bus. The 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 shall 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 shall have the same polarity as the phase side of the power supply, and the common conductor(s) shall be of the same polarity as the grounded side of the power supply.

6. UNINTERRUPTIBLE POWER SUPPLY

6.1 General. The uninterruptible power supply (UPS) will consist of batteries which will recharge through the 120 volt electric service line. In the event of a power disruption, the unit will automatically activate. The transfer from utility power to battery power will not interfere with the normal operations of the traffic controller, conflict monitor, or any other part of the traffic system. A generator port will be provided to accept input from an external generator that can operate the traffic signals. The UPS must be the product of an established manufacturer, and suitable for the service required. The UPS must be manufactured by an established manufacturer who has been in the business for a minimum of five (5) years.

6.2 General Operation

(1) The line power provided by ComEd is nominally 120 volt, single phase, 60 Hertz. The UPS system must take the line power, regulate it, and provide continuous 120 volt, single phase, 60 hertz power to the traffic system. The UPS must regulate the input line voltage within the limits specified herein. The input line voltage must also be transformed and rectified to charge the batteries. Under battery operation, the output from the batteries will go through an invertor to provide the proper A.C. current to provide continuous 120 volt, single cycle, 60 Hertz power to the traffic system. In the event of a power loss, the system must automatically switch to battery operation, without adversely affecting the traffic system. When power is restored, the system must automatically switch back without adversely affecting the traffic system. In the event the UPS system fails, an automatic switch must bypass the UPS and connect unconditioned power from ComEd directly to the traffic system. A manual bypass switch shall also be provided. The system shall be capable of running off a generator. The UPS will allow the generator to be put in or out of the system without adversely affecting the traffic system.

(2) The system will be capable of providing power for normal full timing mode, flash mode, or a combination of both. The operation will be field programmable to activate at various times, to change operation due to changing battery capacities, and to track alarm conditions, using the touch pad or remotely using the RS-232 interface. Programmability shall be in ASCII formats and shall not require any external or proprietary software. The DB-9 connector for the RS-232 interface shall be located on the front panel of the UPS. The UPS must provide a minimum of 4 hours of full normal timing for a full LED controlled intersection.

(3) In the event ComEd line voltage falls outside the high and low limits (95VAC and 130VAC should be the default values) the UPS must transfer the load to battery power. The high and low limits shall be programmable.

(4) The UPS must return to line mode when the ComEd power is restored within the proper limits for a specified period of time. The limits shall be programmable. The default values should be 105VAC and 125VAC. This time shall be programmable and should range from 3 to 30 seconds.

(5) The transfer time allowed, from disruption of normal utility line voltage to batteries or from batteries back to line voltage, must be such that the traffic signal system is not disrupted. The maximum transfer

time allowed will be 60 milliseconds.

6.3 Specifications

(1) The UPS capacity will be a minimum of 2000VoltAmps/ 1500 watts.

(2) The inverter shall have a minimum efficiency of 80%.

(3) The UPS will have an operating range of between -37°C. to +74°C.

(4) The manual bypass switch shall be rated at 240 volts, 40 amps.

(5) The UPS shall have a temperature compensated battery charging system. The charging system must compensate over a range of 2.5mV to 4 mV per degree centigrade per cell. Batteries must not be charged when temperatures exceed 50°C. The temperature sensor shall be located in the cabinet near the batteries.

(6) The charger shall be rated at 10 amps at 48 VDC.

(7) When under battery operation the UPS output voltage must be between 110 VAC and 125VAC, with a sine wave with THD less than 3% at 60 Hertz (±3 Hz).

(8) The UPS shall be equipped to prevent a malfunction feedback to the utility service or to the cabinet per UL 1778, Section 48 "Back-Feed Protection Test". The upstream back-feed voltage from the UPS must be less than 1 volt AC.

(9) The UPS shall have a lightning surge protection in compliance with IEEE/ ANSI C.62.41 for 2000 volts AC.

(10) The UPS shall not weigh more than 50 pounds.

(11) The UPS shall have a minimum efficiency of 95%.

(12) The generator bypass switch shall be supplied with a 30 amp, weather-proof locking receptacle and cover plate.

6.4 Computer Control and Display

(1) The UPS shall include an LCD display with programmable keypad, a red LED and a green LED, and an RS-232 interface.

(2) The UPS processor shall be capable of indicating, through the

LCD display or the RS-232 interface, the current battery charge status, various input/output voltages, power output, battery temperature, date, time, settings of programmable relays, events, and various other functions.

(3) The UPS shall provide a temperature control for the cabinet fan.

(4) The UPS shall be provided with a resettable inverter event counter and a cumulative inverter timer.

(5) The UPS shall be equipped with an event log for a minimum of 100 events. Each event must have a date and time.

(6) The UPS shall be capable of performing a self-test.

(7) Password protection shall be provided.

(8) The following LED conditions shall be used to indicate current status:

RED FLASHING - Alarm
RED STEADY - Fault
GREEN FLASHING - Battery Mode
GREEN STEADY - Line Mode

(9) The manual UPS bypass switch will allow the UPS to be maintained or replaced.

6.5 Battery System

(1) Individual batteries shall be 12 volt, and must be commercially available and easily replaced.

(2) Four 79ah batteries shall be supplied.

(3) The batteries will be connected in series. The wiring harness must be color coded and have quick disconnects.

(4) Batteries must be certified to operate over a temperature range of -25° C. to +74° C.

(5) The batteries shall be extreme temperature, deep cycle, sealed prismatic lead-calcium based AGM/VRLA (absorbed glass mat/valve regulated lead acid) .

(6) Maximum recharge time from protective low cut-off to 80% of full

capacity must not exceed 20 hours.

(7) Thermostat controlled heater strips or pads shall be supplied to keep battery operation efficient.

6.6 Relay Contacts

(1) The UPS shall provide 6 sets of panel-mounted, potential free, fully programmable relay contacts rated at 1 amp, 120 volt. The relays shall be numbered from C1 to C6.

(2) Each relay shall be programmable to activate under any number of the following conditions:

ON BATTERY, relay activates when UPS switches to battery power.
LOW BATTERY, relay activates when batteries have reached a certain level of remaining capacity. This is adjustable from 0 to100%.
TIMER, relay activates after battery power is on for a certain amount of time. This is adjustable from 0 to 8 hours.
ALARM, relay activates after a specific alarm is detected. Alarm conditions include line frequency, low output voltage, no temperature reading, overload, batteries not connected, high temperature, and low temperature.
FAULT, relay activates after a specific fault is detected. Fault conditions include short circuitry, low battery voltage, high battery voltage, high internal temperature, and excessive overload.
OFF, relay is not active.

7. LOAD SWITCH BAY

7.1 General. A panel shall 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 Electrical Standard Drawings 964 and 965.

7.2 Wiring. Panel wiring must be neatly laced and properly terminated individual conductors. They must be insulated and properly sized for their application.

7.3 Load Circuits. Each load circuit shall be capable of carrying fifteen (15) amperes continuously at a temperature of 165° F. (74° C.).

7.4 Bus Feeds. Bus feeds shall be capable of carrying fifty (50) amperes continuously at a temperature of 165° F. (74° C.).

7.5 Equipment. In addition to the items listed in 2(a), the wiring panel shall include, but not be limited to, the following:

(1) Ten (10) ampere fuses with barrier type fuse holders shall be installed between the load switch signal output circuits and field terminals for signal light conductors. Each terminal shall 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 shall 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 shall be rated for a minimum fifteen (15) ampere continuous resistive load and must mate with an S-2412-SB panel socket. A minimum of twelve (12) and a maximum of sixteen (16) load switches to be provided with each cabinet, as defined in the contract.

(3) User Programmable Interface. Two (2) sets of terminal blocks shall 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 shall 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.

7.6 Identification. All field terminals must be suitably identified, subject to approval.

8. FLASHING FEATURE

8.1 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 shall 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.

8.2 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.

8.3 Flasher Circuits. Flashers shall 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.

8.4 Manual Flash. A manual flash switch shall 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.

9. POLICE PANEL

9.1 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.

9.2 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 contract. 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 be possible to manually step through a vehicle clearance interval.

9.3 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.

9.4 Space Requirement. Adequate room must be provided in the police panel section to store the manual switch and retractable cord.

10. RELAYS

10.1 Transfer Relays. Eight (8) double pole, double throw, flash transfer relays shall be furnished with each controller. These relays must be jack mounted into an S-408-SB, or equivalent, socket mounted on the controller panel.

10.2 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.

10.3 Dust Cover. A suitable dust cover must be furnished for each relay.

10.4 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.

11. COMMUNICATIONS INTERFACE PANEL

11.1 Where a communications interface has been specified 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 modem must either be a multi-directional "star" type or a bi-directional type, as specified in the contract. 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 Electrical Standard 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 and 6' long in Master 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 a 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.

12. RAILROAD INTERCONNECT REQUIREMENTS

12.1 General. The railroad preemption will meet the requirements of the ICC (Illinois Commerce Commission) and the requirements of IDOT (Illinois Department of Transportation).

12.2 IDOT. The railroad preemption will meet all the requirements of the Illinois Department of Transportation's Standard Specifications for Road and Bridge Construction, adopted January 1, 2012. It must meet all the requirements of Article 1073.01 (c) (2) and Article 1074.03 (a) (5) e.

12.3 ICC. The railroad preemption will meet all the requirements of the Illinois Commerce Commission, as stated herein.

(1) The railroad preempt relays and the City traffic cabinet in general must be able to be wired as indicated in IDOT's Standard 857006-01 "SUPERVISED RAILROAD INTERCONNECT CIRCUIT". A failure in the interconnection circuit will result in activation of a supervisory failure alarm.

(2) Remote Flash. The Remote Flash input to the controller must be

inverted from normal NEMA logic. Instead of grounding the input to Logic Ground (0 volts DC) to activate, the Remote Flash will be normally grounded and will be activated when the input is in the Logic 1 (+24 volts DC) state. This will preclude the installation of a controller without the proper railroad software and a normal controller with standard (non-railroad) software will not be able to run the traffic signals.

(3) Critical Components Series Loop. All critical components to railroad preemption such as relays and harnesses must utilize the 24 VOLT DC monitor voltage to form a series loop. Removal of any component will result in the traffic signals entering a flashing red condition. The 24 VOLT latch in the Management Malfunction Unit will be programmed, requiring manual reset if a failure in the series loop occurs.

(4) Controller Preempt Input Verification. Like the supervisory interconnection circuit monitors the integrity of the interconnect cable, this feature monitors the integrity of the controller railroad preemption input and associated wiring within the traffic controller cabinet. This will utilize a secondary railroad preemption input that is normally active (on) when no demand for railroad preemption is present. When a demand for railroad preemption is received, the normal railroad preemptor input is applied and the secondary input is dropped. If both inputs are either simultaneously on or simultaneously off for a time period of more than one (1) second, the controller will recognize this as an input failure. When a failure occurs, the traffic controller will be configured to provide a track clearance interval followed by a flashing red condition. This occurrence will set a preempt input alarm and also will require a manual reset of the controller.

(5) Track Clearance Green Re-service. Any demand for railroad preemption received at any point in the normal sequence, the emergency vehicle preemption sequence, a bus preemption sequence, or any other form of low priority preemption, or a previously called for railroad preemption sequence will result in the traffic controller providing a track clearance green indication within a “maximum time to track clearance green “ (usually 8 seconds depending upon site specific criteria) and will provide a full track clearance green time interval after the preemption demand was received. The controller software must have the capability to restart the railroad preemption sequence providing a full track clearance green interval from any point within the railroad preemption sequence from the start of track clear green through the entire dwell/hold interval(s) including any exit yellow

and red clearance intervals, if the demand for preemption drops and is reapplied. The number of times the controller is able to react to successive demands for railroad preemption must not be limited. This will be a software based routine that does not require any user programming and must be designed into the software.

(6) Preemption Priority. Preemptor number 1 is typically assigned to a supervisory failure in the interconnection circuit and preemptor 2 is typically assigned to a normal railroad preemption demand. Preemptor 1 must have priority over preemptor 2. Preemptor 2 must have priority over all other forms of preemption.

(7) Delay Time. In order to compensate for noisy or intermittent calls, the controller must have a programmable delay timing parameter for railroad preemptors, programmed at 1 second. Any demands for railroad preemption lasting less than this time will be ignored. This will apply to any subsequent demands for railroad preemption that may occur while the controller is still within the railroad preemption sequence from a prior demand.

(8) Non-Locking Preemption. The controller must have the capability to configure the railroad preemptors as non-locking calls. If a demand for preemption is placed for a duration of less than 1second (as programmed in the delay timer), the call will not lock and the controller will not initiate the preemption sequence. Furthermore, if an initial demand for preemption is dropped prematurely while the preemption sequence is still timing, the non-locking feature will allow the controller to re-service another demand for preemption.

(9) Minimum Green before Preemption. The controller must have a separate minimum green timing parameter, programmed at 1 second, that replaces normal controller phase minimum green times when entering railroad preemption. When a demand for preemption is applied, any active phase(s) must terminate immediately or after they have been active for 1 second if the demand occurs at the start of the phase(s). If any indications that are part of the track clearance green are active when the demand for railroad preemption is placed, those indications will not terminate until after the track clearance green interval is completed.

(10) Railroad Hold/Dwell Interval. The controller must have the capability to display a programmable phase(s) and rest in that phase(s) until the demand for railroad preemption is released. The controller must also have the option to cycle between a set of

programmable phases that don't conflict with the railroad crossing, or rest in an all-red steady state until the demand is released. The necessity for cycling during the hold interval or the use of an all-red steady state is determined by an assessment of the specific site. The controller must have a timing parameter that will provide a minimum hold/dwell time, even if the demand for preemption is dropped prematurely. The controller must be able to re-service any subsequent demands for preemption during this minimum hold/dwell time.

(11) Railroad Hold/Dwell Extension. The controller must have a timing parameter that will extend the hold/dwell interval for a programmed time after the demand for railroad preemption has been released. The controller must be able to re-service any subsequent demands for preemption during this extension time.

(12) Pre-signal Timing. When pre-signals are present in advance of a railroad crossing, during normal operation the pre-signal green indications terminate a programmable time (timed overlap) prior to the indications at the intersection. The duration of the timed overlap should not be reduced when leaving normal operation to service other forms of preemption, such as emergency vehicle or bus preemption. If a demand for railroad preemption occurs during the timed overlap portion of the normal sequence, the overlap timer must terminate and the track clear green interval must begin immediately, after the pre-signal yellow and red vehicle clearance intervals are completed.

(13) Remote Monitoring and Alarms. Capabilities to remotely monitor the traffic controller must be provided, including the capability to monitor the operation of the controller, upload logs/events, and to verify the integrity of the database. In addition, the controller must have the ability to automatically report alarms, such as preempt 1 activation, preemptor input failure, automatic flash, CRC failure, 24 volt failure, and other defined alarms. The controller must have the ability to prevent the remote download of changes to the critical data protected by the railroad preemption security feature.

(14) Blank-out Signs. If these signs are used for railroad preemption, they should activate immediately with the activation of the railroad interconnect circuit. They should deactivate immediately with the deactivation of the interconnect circuit, not after the controller exits the railroad preemption sequence. Whenever the traffic signals are in flashing red operation, cabinet circuitry must be such that the signs will remain operational if the interconnect circuit activates due to railroad warning device activation.

12.4 CRC. A CRC module with all connections, a USB memory device, software, and any other firmware necessary to make the CRC fully functional will be provided if so designated.

(1) Hardware. A 16 bit CRC (cyclical redundancy check) module must be provided. The module will connect to the ATC controller using unused I/O pins. Reassignment of unused inputs on the NEMA 'A', 'B', and 'C' connector I/O pins or connection to a proprietary 'D' module's input pins will be acceptable. The final CRC value for the specific intersection requirements will be set on the module for that intersection. Removing the CRC module during normal operation of the intersection, or mismatching the values in the database and the CRC, will result in a fault condition and put the intersection in flash mode.

(2) Software. The controller software/firmware will provide the logic and control facilities to fully implement CRC error detection. All the data elements (objects) required for the implementation will be contained in a proprietary data block. The software will provide a mechanism to "display" the final CRC value to be set on the CRC module.

A USB memory device will be utilized to 'lock' or 'unlock' the database. When the USB device is inserted into the controller, the controller will display a menu that will include a utility to 'unlock' the database. The USB device will contain a file structure that will allow access to the protected areas of the database. Once 'unlocked', the database can be edited through normal user interfaces. While the database is 'unlocked', the controller will drop the voltage/fault monitor signal to the conflict monitor to keep the intersection in flash. The CRC comparison check will be disabled during this period.

After all the changes to the database are completed, the user will use a utility on the USB to 'lock' the database. After the database is 'locked', another utility will allow the calculated CRC to be displayed. This can be used to configure the CRC module. After the CRC is connected and the USB is removed from the controller, the voltage/fault monitor signal to the conflict monitor will be enabled. A restart will be required to restart the controller.

Once the CRC module has been set (programmed), and the database has been locked, the controller can resume normal operation. The controller firmware will validate the stored CRC against the CRC module's value at least once per second.

13. WIRING

13.1 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.

13.2 All VAC connections to load switches, flasher, and flash transfer relays must be soldered. All VAC connections on back of terminals must be soldered.

13.3 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 Division of Electrical Operations.

14. TESTING REQUIREMENTS

14.1 General. The testing on the controllers must be done as described herein. Environmental testing must be done at the manufacturer’s facilities or at an independent laboratory, and must be certified by the manufacturer or the independent laboratory. Functional testing will be done at the City’s facilities. All controllers provided under the contract must be tested as stipulated under “Functional Burn-In Testing” and “Physical Inspection” at the manufacturer’s facilities. If a controller is ordered for a specific location, the manufacturer shall program and test the controller at the factory and certify the test results.

14.2 N.E.M.A. Environmental Test. One controller, unless approved previously, 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 sixty-four (64) 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.

14.3 Functional "Burn In" 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, 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. 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 seventy-two (72) hour function test as described in this specification. The "burn in" requirement must include a test that uses all sixty-four (64) 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 normal functioning of the controller phasing must be supplied. A copy of the test program must be approved by the City of Chicago, Division of Electrical Operations prior to testing. Certification of these tests must be attached to the outside of the shipping container. This certification is in addition to any other documentation and/or testing required by these specifications.

14.4 Testing Requirements. In addition to the NEMA environmental test and the "burn-in" requirements stated above, satisfactory performance of the traffic signal cabinet and its equipment must be demonstrated. 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 controller will be accepted until the "test procedure document" has been approved. Functional testing must include, but not be limited to, phasing for multiple legged intersections, bridge and railroad pre-empts, flash operation, actuation, and any combinations of these features. Controllers designed to function without railroad pre-empts must be shown to function without the presence of a railroad interconnect. Options for downward compatibility when replacing either HMC1000 controllers or LMD40 controllers must also be demonstrated. In addition, it should be demonstrated that the controller functions within the MIST system. Any failure must be addressed by the manufacturer within the time frame allotted.

14.5 UPS. Testing of the equipment must verify that the operation meets the requirements of this specification. All equipment must be shown to operate correctly, including the rectifier, charger, inverter, batteries, and control unit.

The UPS must be connected to a dummy load at the factory and tested for performance under various conditions of line voltage and frequency, varying loads, temperature range, and humidity range. The automatic switching must be successfully demonstrated; losing line power and restoration of line power must not adversely affect the operation of the traffic signals. Use of the manual bypass switch must be successfully demonstrated. A generator must be connected to the unit and successfully operate the system without interruption. The batteries must be shown to be able to operate the traffic signals for the specified time. The batteries must be shown to be able to be recharged in the specified time between failures. The control unit, including the LCD display and the RS-232 interface, must be shown to function according to this specification. All reports and event monitoring must be successfully demonstrated. Programming functions must also be shown to work properly.

14.6 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.

14.7 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.
(11) Generator Hook-up.

15. SHIPMENT AND DELIVERY (Only applies to City commodity contracts)

15.1 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. The UPS and cabinet must be wrapped to give protection from the elements, as well as from shipping. 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.

15.2 Delivery. The assembled cabinets, or subassemblies and parts, must be delivered to the Division of Electrical Operations at 2451 S. Ashland Avenue, unless otherwise directed. Assembled cabinets, or subassemblies and parts, must be available for testing and shipping within six weeks of the placement of an order.

CHICAGO ATC MATRIX - TABLE A

(ATC Standard Version 5-2b June 26, 2000)

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	• 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	In order to show the Ethernet communications to the Engine Board, the following "Reserved" pins can assume the following legacy functions: • 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	• Engine Board shall not draw

			more than 4W of power from VPRIMARY (due to battery backup in Chicago) • Engine **may** supplement VSTANDBY_5 with on-board storage for its standby power.
Use of ATC Engine Board	5.4.3	Required	• All optional baud rates shall be supported
Parallel I/O	2.2.4	Required	• 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	• BSP RTC driver shall automatically update the RTC with the OST time once per second with an accuracy of 0.1 seconds • 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	Only 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	• 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	• 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	
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 (25-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 “Port 4”. C50_ENABLE shall not be supported. A second serial port shall fully satisfy this section as an EIA-574 (25-pin) and be labeled “Port 5.”
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	
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	• 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 • 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 7.2.2 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	12 V not required As applicable for NEMA cabinets only
Mechanical/Chassis	7.3.1.3 7.3.1.4	Required	• 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 8.2.2.1 8.2.2.2 8.2.2.3	Required	• Support for TS2 Type 2 and TS1 Interfaces
I/O Interfaces	8.1.2 8.2.2.5	Required	• 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	• No support for Model 332 Cabinets or ITS Cabinets & devices is to be provided
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

SPECIFICATION 1606
DIVISION OF ELECTRICAL OPERATIONS
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
OCTOBER 10, 2017

ARTERIAL STREET LIGHTING CONTROLLER

SUBJECT

1. This specification states the requirements for an arterial street lighting controller and aluminum cabinet for use in controlling arterial street lighting circuits. The cabinet shall be mounted on top of a ballast base housing, which will be affixed to a concrete foundation.

GENERAL

2. (a) Specifications. The controller shall conform in detail to the requirements herein stated, to the Federal Standard cited by number, and to the specifications and methods of test of the American Society for Testing and Materials, cited by ASTM Designation Number, in which the most recently published revision will govern. Cabinets must meet or exceed the requirements of a NEMA rating 3R and must be U.L. listed.

(b) Acceptance. Controllers and cabinets not conforming to this specification will not be accepted.

(c) Drawings. The drawings mentioned herein are drawings of the Department of Transportation, Division of Electrical Operations, and must be interpreted as part of these specifications cooperating to state necessary requirements.

(d) Sample. One complete controller in cabinet of the manufacture intended to be furnished must be submitted upon request of the Chief Procurement Officer within fifteen (15) business days after receipt of such a request. The sample must be delivered to the attention of the Engineer of Electricity, Division of Electrical Operations, 2451 South Ashland Avenue, Chicago, Illinois 60608.

(e) Warranty. The manufacturer shall warranty the controller and cabinet against flaws in material or workmanship for a period of two (2) years from the date of delivery. Any controller or cabinet developing flaws within this period must be replaced by the manufacturer, including shipment, at no cost to the City.

DESIGN

3. (a) Drawings. The control cabinet must conform in detail to requirements shown on Drawing 876 for a 100 Amp application and to Drawing 880 for a 200 Amp application.

(b) Material. The cabinet and the door assembly must be constructed of 5052-H32 sheet aluminum alloy, with a minimum thickness of .125 inches. The base plate must be sheet aluminum of .250 inch thickness. All electrical components and wiring must be as shown on the appropriate drawings.

(c) Dimensions. The overall outside dimensions of the 100amp control cabinet must be 36 inches in height by 20 inches in width by 15 inches in depth. The overall outside dimensions of the 200 amp control cabinet must be 41 inches in height by 25 inches in width by 16 inches in depth. Cabinets must have sloped tops to shed water.

CABINET REQUIREMENTS

4. (a) Cabinet. The cabinet must be sized as shown on either Drawing 876 or Drawing 880, depending on the controller amp rating. The cabinet door opening must be double flanged on all four (4) sides. A door restraint must be provided to prevent the door from moving in windy conditions.

(b) Door. The door size must be a minimum of 80% of the front surface area. The door must be hinged on the right side when facing the cabinet. The door must have a gasket that meets the requirements found in U.L.508 Table 21.1. The gasket must form a weather-tight seal between the cabinet and the door. The door, when closed, must be flush with the cabinet.

(c) Hinges. Hinges must be continuous and bolted to the cabinet and door with 1/4-20 stainless steel carriage bolts and nylock nuts. Hinges must be made of .093 inch thick aluminum. The hinge leaves must not be exposed externally when the door is closed. Only the hinge knuckles must be visible upon closing the door. The hinge pin must be .250 inch diameter stainless steel and must be capped top and bottom by weld to render it tamper-proof.

(d) Latching. The latching mechanism must be a three-point draw roller type. The pushrods must be aluminum. The rollers must be nylon with a minimum diameter of .875 inches. The center catch must be .187 inch aluminum, minimum.

(e) Handle. The handle must be stainless steel with a .750 inch diameter shank. The handle must have provision for a padlock. The lock must be

keyed dead bolt #200725 or equivalent. Two (2) keys must be provided for each cabinet.

(f) Ventilation. Louvered vents must be provided in the door. Louvers must satisfy the NEMA rod entry test for 3R enclosures. A removable filter must cover the louvers from inside the door. The filter must be held firmly in place with top and bottom brackets and a spring-loaded clamp. Exhaust air must be vented out between the top of the cabinet and the door. The exhaust area must be screened with openings of .12 inch by 1.0 inch.

(g) Equipment Mounts. The cabinet must be equipped with two (2) adjustable AC@ channels on both side walls and on the back wall. The internal dimensions of the channels must be 1.075 inches high by .625 inches wide. All mounting hardware must be furnished.

(h) Workmanship. All control cabinets must be free of flaws, and must have neat, smooth exterior surfaces. All holes must be accurately located and drilled. All welds must be neatly formed and free of cracks, blow holes, or other irregularities. All inside and outside edges must be free of burrs.

(i) Painting. The cabinet, door and other parts must be treated by an iron phosphate conversion technique. After which, all the parts must be baked dry. A polyester powder coat must then be applied. The inside of the cabinet and door must be white. The outside of the cabinet and door must be green meeting No. 14110 of Federal standard Number 595, or a gloss black, or another color as specified. A paint chip must be provided upon request.

PANEL

5. (a) The panel must be composed of phenolic plastic ½ inch in thickness, or an approved equal. It must be securely bolted to the cabinet using stainless steel hardware.

(b) The panel will be sized, cut, and drilled as shown on the appropriate standard drawing. For a 100 amp and 200 amp – 2 pole controller, the panel must comply with Drawing 984. For a 100 amp and 200 amp – 3 pole controller, the panel must comply with Drawing 984. If alternate components are proposed, the panels must be sized accordingly.

ELECTRICAL COMPONENTS

6. (a) All components will be as indicated on the appropriate drawing, or will be approved equals. Circuit breakers must have thermal magnetic trips. Each breaker must be enclosed in a hard insulated housing. All breakers must be UL listed. The photo-cell relay, if required, must meet

City specifications.

(b) Wiring will be as indicated on the appropriate drawing. All wire will have stranded copper conductors, unless indicated otherwise. All wires must be insulated with an approved 125º Centigrade insulation.

(c) For a 3-wire, 1-phase, 240 volt ComEd input, components and wiring will be as indicated on Standard Drawing 983 (for either 100 amp or 200 amp service). For a 4-wire, 3-phase, 120/208 volt ComEd input, components and wiring will be as indicated on Standard Drawing 983 (for either 100 amp or 200 amp service).

THIS SPECIFICATION SHALL NOT BE ALTERED

ELECTRICAL SPECIFICATION 1608
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED APRIL 2, 2021

ROADWAY LIGHTING CONTROL SMART NODES

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1. SUBJECT

This specification states the requirements for smart lighting control nodes. Each external or internal individual node is to be wired to an individual roadway luminaire. A third node will be used for control of a group of luminaires. Each node shall be connected to a wireless mesh network. There are three nodes specified. One node will consist of a standard twist-lock type (external node) which will be mounted to a matching receptacle on the outside of a roadway luminaire. The second type node will be mounted internally to a luminaire (internal node). The third type of node shall control a group of luminaires on a common circuit (circuit node). The nodes shall provide two-way wireless communications between the luminaires and the City's smart lighting system. Functions shall consist of energy monitoring, on/off control, dimming, and outage reporting.

2. GENERAL

2.1 Information Required. Each bidder shall submit with his proposal the following information relative to the nodes he proposes to furnish.

(1) Manufacturer's catalog description, including manufacturer's name and catalog ordering numbers.

(2) Specification sheets.

(3) Any other information as required herein.

2.2 Assembly. Each control node shall be delivered completely assembled, wired, and ready for installation.

2.3 Warranty. The manufacturer shall warrant every node against any defects due to design or workmanship developing within a period of five (5) years after the nodes have been accepted by the City. This will be interpreted particularly to mean failure of any component impairing the proper operation of the unit. Any

node developing defects within this period shall be replaced by the manufacturer at their sole expense and without cost to the City.

2.4 Sample. If so requested, a sample of the nodes of the manufacture intended to be furnished under this contract must be submitted to the Division of Electrical Operations within fifteen(15) days upon receipt of a request from the Chief Procurement Officer.

2.5 The manufacturer shall be ISO 9001 certified for quality management in the manufacturing field.

2.6 Nodes shall be FCC compliant for non-electrical interference.

2.7 Compliance. The nodes shall conform in detail to the requirements herein stated, and to the standards herein cited, of which the latest revisions shall govern.

3. HOUSING

3.1 Housings shall be molded of a UV stabilized polycarbonate, pigmented to an approved color. The housing is required to be impact resistant.

3.2 A weather-proof, permanent label shall be attached to each unit indicating the manufacturer's name, month and year of manufacture, model and serial number, voltage and load ratings, and provision for marking installation and removal dates.

3.3 The dimensions of the external twist-lock node shall not exceed 5" high by 3.5" in diameter. The external node shall not weigh more than10 ounces.

3.4 The dimensions of the internal node shall not exceed 2.5" high, 4.25" length, and 3.5" width. The internal node shall not weigh more than 11 ounces.

3.5 The internal smart node and the circuit smart node shall have lead wires of approximately 12 inches.

3.6 The external node shall have a neoprene or other approved gasket attached to the base to effectively seal the connections against weather and dust.

4. ENVIRONMENTAL

4.1 The nodes shall operate within the temperature range of -40° C to +70° C.

4.2 The external node shall have an ingress protection rating of IP66.

4.3 The internal node shall have an ingress protection rating of IP65.

4.4 The circuit node shall have an ingress protection rating of IP65.

5. ELECTRICAL

5.1 The nodes must function properly within the existing City lighting circuits and the power distribution system as provided by ComEd. Existing conditions shall not adversely affect the nodes, nor keep them from performing properly.

5.2 Power consumption shall be less than 2watts (at 120 volts).

5.3 The nodes must be stable and reliable over the range of 105 to 305 volts A.C., at 50/60 cycles.

5.4 Surge Arrestor. Over voltage protection shall be provided for the control components and the load circuit by means of a metal oxide varistor (MOV) or other specifically approved type arrestor. It must limit high voltage surges to a value at least 20% below the basic impulse insulation level (BIL in accordance with EEI-NEMA) of the control. The MOV must be rated for a minimum of 320 joules 6KV/3KA. In both external and internal nodes, the MOV must be mounted internally in the control housing.

5.5 Switching Relay. The ON-OFF switching operations shall be accomplished by normally closed contacts which must be opened by means of a rugged, properly rated, magnetic relay, subject to approval. The switching shall be positive and free of chatter and/or sticking of contacts. The contractor must provide test data verifying that contact chatter does not exceed 5 milliseconds when operated under loads as herein specified. The relay must have contacts of silver alloy, tungsten, or other specifically approved material.

5.6 Capacity. Maximum pass through current shall be 10 amps. Maximum loading shall be 1500VA (960 watts).

5.7 Circuit nodes shall have an external antenna. The antenna shall be capable of being mounted to a cabinet and be weather hardened and vandal resistant. Lead wires for the antenna shall be included with each circuit node. A single antenna shall be capable of being shared by multiple nodes.

5.8 External twist-lock nodes shall be 7-pin. Internal nodes and circuit nodes shall have 7 lead -in wires. The circuit node shall also have wires for the antenna.

6. OPERATION

6.1 The external nodes shall meet the requirements of ANSI C136.10 for twist-lock controls, as well as UL 773. All nodes shall meet the requirements of ANSI C136.41 for dimming control.

6.2 Internal nodes shall be able to communicate with the network even when installed inside the metal housing of a luminaire.

6.3 If an external node loses communication, then operation will default to the photo-cell. If the photo-cell malfunctions, the control will default to the on position.

6.4 If an internal node or circuit node loses communication, then the default operation of the node will provide power to the luminaire and the luminaire will remain on or be turned on.

6.5 Ability for Light turn-on or turn-off by programmed schedule.

6.7 0-10VDC driver control, allowing dimming.

6.8 Remote control and reporting (two-way communications).

6.9 Metering.

(1) Energy metering (0.5% accuracy).

(2) Energy metering by hour, day ,minute, with record keeping.

(3) Metering Range: 105 to 305 VAC, 10A RMS (ANSI C12.20)

7. PHOTO-CONTROL

7.1 The internal smart nodes and the circuit smart nodes shall not have a built-in photo-cell.

7.2 The external twist-lock node shall have a built-in photo-cell.

(1) Photoconductive Cell. The photocell shall consist of a suitable substrate, a chemically inert electrode material and a thin layer of photosensitive cadmium sulfide or other acceptable photosensitive material. It must be hermetically sealed in a glass to metal package to prevent moisture and contamination damage. Plastic cased cells are not acceptable. Filtered silicon sensors in clear epoxy cases are also acceptable. The cell must not be subject to overloading due to the demand of the design circuit nor the

ambient temperatures surrounding the cell.

(2) The external node control must be calibrated at 120 VAC for a "turn-on" setting of 1.50 ± 0.30 horizontal foot candles of natural illumination with a 2-5 second turn OFF delay. The "turn-off" setting must be adjusted to one and one half (1.5) times the "turn-on" setting. The external node control must have a 1-2 second turn ON delay.

8. NETWORKING

The control nodes must operate on an open standards secure (WiSun) IEEE 802.15.4g wireless mesh based multi-application network with embedded Itron (formerly Silver Springs Network) communications.

The control nodes shall support Frequency-Hopping Spread Spectrum up to 300kbps mesh networking as well as automatic data routing with self-configuration, auto-healing & redundant uplinks.

The nodes shall operate within the City's Itron network.

9. SECURITY

The control nodes must have full application and link-layer security with full PKI(Public Key Infrastructure), Advanced Encryption Standard AES-128 or AES 256, and embedded firewall which includes .integrated multi-layer security with end-to-end encryption and capability to prohibit unauthorized access.

10. PACKAGING

10.1 Carton. Each smart lighting control node shall be individually packed in a carton of adequate strength and properly secured and protected to prevent damage to the unit during shipment, handling and storage. A master carton shall contain multiple units, each in individual cartons.

10.2 Marking. Each carton shall be clearly marked on the outside with the legend "SMART LIGHTING INTERNAL CONTROL NODE", "SMART LIGHTING EXTERNAL CONTROL NODE", or "SMART LIGHTING CIRCUIT NODE" (or similar as appropriate), with the number of units in the carton: volt-ampere load rating, voltage, manufacturer's name and catalogue number, and shipping or manufacturing date.

ELECTRICAL SPECIFICATION 1610
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
OCTOBER 20, 2017

SPLIT PEDESTAL BASE: FOR CHICAGO 2000 LIGHT POLE ASSEMBLY

SUBJECT

1. This specification states the requirements for a split pedestal base (Clamshell) for installation on a 10 inch by 34 foot- 6 inch tapered tubular, 3 gauge and 7 gauge steel anchor base poles with mast arm supports. This specification will address the requirements for a split fiberglass base without doors.

SUBMITTAL INFORMATION REQUIRED

2. (a) Manufacturer's Shop Drawings. Scaled manufacturer's shop drawings showing actual split pedestal base dimensions and details. Shop drawings must be original engineering drawings created by the manufacturer; photocopied or scanned copies of the Standard Drawings will not be accepted, and will be rejected as an incomplete submittal.

   Dimensions must include but will not be limited to: base height, width, pattern, and fluting. Details must include scaled and dimensioned plan views, front elevations, side elevations, and section views as required.

   (b) Manufacturer's catalog cut sheets showing split pedestal base designation, and catalog number.

   (c) Manufacturer's specifications including fabricating materials and processes.

   (d) Manufacturer's written installation instructions and maintenance manuals including recommendations and/or procedures for storage, assembly, orientation, and installation.

   (e) Sample. If requested by the Chief Procurement Officer, one completely assembled split pedestal base with hardware and all components, of the manufacture intended to be furnished, shall be submitted for review within fifteen (15) business days from receipt of notice. The sample base must be coordinated with an existing 34 foot-6 inch tapered tubular for accuracy of fit.

(f) Warranty. The manufacturer must warrant the performance and construction of these split pedestal bases to meet the requirements of this specification and must warrant all parts, components, and appurtenances against defects due to design, workmanship, or material developing within a period of five years after the bases have been delivered. This will be interpreted particularly to mean structural or mechanical failure of any component, or failure or fading of the surface color. The warranty must be furnished in writing guaranteeing replacement, including shipment, free of charge to the City, of any split pedestal base, which, as determined by the Commissioner, would develop aforesaid failures. Any split pedestal base, or part thereof not performing as required or developing defects within this period, must be replaced by the manufacturer at no cost 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. Any cost for the warranty as specified must be incidental to this contract.

GENERAL

3. (a) Products. Split pedestal bases must be the products of established manufacturers and must be suitable for the service required. Split pedestal bases which are proposed must be the products of a single manufacturer. The manufacturer shall have been in the business for at least five years.

(b) Specifications. The split pedestal bases must 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.

(c) Drawings. The drawings mentioned herein are drawings of the Department of Transportation being an integral part of this specification cooperating to state the necessary requirements.

(d) Design. The base must conform in design and dimensions to Standard Electrical Drawings 808, 824, 827 and modified to accommodate non-fluted pole 986.

(e) Approval. Whenever "approval" and "approved" are used in this specification they will mean a written approval by the Commissioner to be secured prior to proceeding with manufacture of the split pedestal bases.

(f) Commissioner's Review. The Commissioner will be the sole judge in determining the submitted split pedestal bases compliance with this specification. The Commissioner's decision will be final.

CONSTRUCTION OF FIBERGLASS BASE

4. (a) Each pedestal base must be formed of a fiberglass composite consisting of a polyester resin and containing a minimum of 65% fiberglass by weight. The resin must contain no clay fibers. The composite must be UV and weather resistant. Alternate materials may be considered. Each base half must be permanently marked on the inside identifying it as a base for a Chicago 2000 assembly.

(b) The split pedestal base must conform in detail and dimensions to Standard Electrical Drawings 808, 824, 827 and 986.

(c) The two halves of the clamshell must be identical to each other. They must be perfectly matched and when installed there shall be no more than a 0.125 inch gap between the inside top of the assembled base and the outside surface of the mast.

(d) Once installed, the base should be designed to remain in place without the use of set screws. An installed base should not be able to be shifted or rotated.

(e) The color of the base must be gloss black and must match the color of existing and proposed light 3 gauge and 7 gauge steel anchor base poles with mast arm supports. The resin must contain color pigment throughout. The pigment must be even throughout the thickness of the base. A finish coat of urethane enamel must be applied to the surface of the base to a minimum dry thickness of 1.5 mils. The resin color must match the enamel color. A paint sample on fiberglass must be submitted for approval prior to production. The paint manufacturer's name and any information necessary to acquire the same color for the pole must be provided. The contractor must supply one quart of touch-up paint for every 50 bases ordered.

(f) The texture of the fiberglass base exterior surface must be equal to that of a cast iron base. Acceptance of the aesthetic appearance of the base will be by the Commissioner.

(g) The two halves of the shroud must be affixed by means of screws as shown on the Standard Drawings. The screws must fit so that the halves of the base are drawn together so that the edges of the base fit snug against each other. Threaded stainless steel inserts in the base must be used to affix the screws. The screws must not detract from the appearance of the base. Other methods of attachment may be considered. Any method of attachment must be approved by the Commissioner.

TESTING

5. (a) Testing. All completed fiberglass bases must be available for testing. Unless specifically authorized in writing, all tests must be at the manufacturer's plant. A record of every test must be made and a certified copy of the test record must be submitted to the Commissioner before the units are shipped. Tests shall be standardized according to ASTM requirements or other suitable organization's standards. The manufacturer must provide evidence that the bases are structurally sound and are able to take the normal abuse of salt spray, freeze-thaw cycles, and exposure to moisture. The bases must be impact resistant and must be resistant to UV damage.

PACKAGING

6. (a) General. The split pedestal bases must be carefully inspected at the factory prior to shipment to assure that the bases are complete and free of defects. When bases are stacked together, they must be supported with suitable spacers or must otherwise be protected from dents and other potential shipping damage. The spacing and protective materials must be suitable for and usable in the storage of the bases. All hardware must be packaged in a clear container and labeled as to size, quantity, and part association.

(b) Packaging. The split pedestal bases must be shipped on pallets with at least six units per pallet. Each base must be individually wrapped and protected so that it can be bundled and unbundled without damage to the base or its finish. The base wrapping must be labeled to identify the base. Specific instructions must be securely attached to each pallet indicating the proper methods of storage. In addition, each pallet must contain specific instructions on the installation of the split pedestal bases. Instructions must be printed on a fiber based paper with a permanent ink so that instructions will be completely legible after weathering outdoors for a minimum of 5 years. The pallets must be labeled in 3/8 inch high lettering indicating the type of base as "FIBERGLASS BASE FOR CHICAGO 2000 SYSTEM", the part number, the manufacturer, the date of manufacture, and the contract number.

(c) Hardware. Any hardware not attached to the bases must be carefully wrapped and securely attached to each pallet. Hardware must be packaged in a clear bag with a label indicating the type of hardware and quantity. Payment will be withheld for any units provided without the appropriate hardware, or for any missing or improper packaging or labeling. Cracked,

broken, chipped or damaged units will also be considered as incomplete quantities as regards payment.

(d) Touch-up Paint. Touch-up paint and appurtenant materials must be packaged in units sufficient for the number of bases on each pallet. These units will be securely attached to each pallet.

ELECTRICAL SPECIFICATION 1611
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED APRIL 9, 2021

ROADWAY LED LUMINAIRE
ORNAMENTAL TEARDROP FOR ARTERIAL STREETS

I. SUBJECT

A. This specification states the requirements for an ornamental Tear Drop LED street light luminaire. The luminaire shall be for arterial street lighting. The overall shape of the luminaire shall be historic teardrop. The LED luminaires will be integrated into a centralized lighting management system. The luminaire must include a fitter and must be fabricated for attachment to a 2" O.D. steel mast arm on a Chicago 2000 light pole system. The luminaire shall be mounted at 30 feet above grade.

II. GENERAL

A. References

American National Standards Institute (ANSI)

- ANSI C78.377-2015, "American National Standard for Electric Lamps—Specifications for the Chromaticity of Solid State Lighting (SSL) Products"
- ANSI C82.77-10-2014, "American National Standard for Lighting Equipment—Harmonic Emission Limits—Related Power Quality Requirements"
- ANSI C136.2-2015, "American National Standard for Roadway and Area Lighting Equipment—Dielectric Withstand and Electrical Transient Immunity Requirements"
- ANSI C136.10-2010, "American National Standard for Roadway and Area Lighting Equipment—Locking-Type Control Devices and Mating Receptacles—Physical and Electrical Interchangeability and Testing"
- ANSI C136.15-2015, "American National Standard for Roadway and Area Lighting Equipment—Luminaire Field Identification"
- ANSI C136.22-2004 (R2009, R2014), "American National Standard for Roadway and Area Lighting Equipment—Internal Labeling of Luminaires"
- ANSI C136.25-2013, "American National Standard for Roadway and Area Lighting Equipment—Ingress Protection (Resistance to Dust, Solid

Objects and Moisture) for Luminaire Enclosures"
- ANSI C136.31-2015, "American National Standard for Roadway and Area Lighting Equipment—Luminaire Vibration"
- ANSI C136.37-2011, "American National Standard for Solid State Light Sources Used in Roadway and Area Lighting"
- ANSI C136.41-2013, "American National Standard for Roadway and Area Lighting Equipment–Dimming Control Between an External Locking Type Control and Ballast or Driver"
- ASTM B85/B85M-14, "Standard Specification for Aluminum-Alloy Die Castings"
- ASTM B117-16, "Standard Practice for Operating Salt Spray (Fog) Apparatus"
- ASTM D523-14, "Standard Test Method for Specular Gloss"
- ASTM D1654-08, "Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments"
- ASTM G154-12a, "Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials"

Illuminating Engineering Society of North America (IES)

- ANSI/IES LM-63-02, "Standard File Format for Electronic Transfer of Photometric Data"
- IES LM-79-08, "Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products"
- ANSI/IES LM-80-15, "IES Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays and Modules"
- ANSI/IES RP-8-14, "Roadway Lighting"
- IES TM-21-11 (with Addendum B), "Projecting Long Term Lumen Maintenance of LED Light Sources"

Institute of Electrical and Electronics Engineers (IEEE)

- IEEE Std 1789-2015, "IEEE Recommended Practices for Modulating Current in High-Brightness LEDs for Mitigating Health Risks to Viewers"

International Electrotechnical Commission (IEC)

- IEC 60929:2011 (with Amendment 1), "AC and/or DC-supplied electronic control gear for tubular fluorescent lamps - Performance requirements"

Underwriters Laboratories (UL)

- ANSI/UL 1598 (3rd Edition), "Luminaires"

B. Submittal Requirements:

The bidder shall submit the following information pertaining to the specified luminaire type:

A. Completed ATTACHMENT B – Submittal Form

B. Product Data Sheets.

a) Luminaire data sheets – including summary product description, dimensioned outline drawings, and nominal characteristics including but not limited to: initial luminous flux (lumens), input power (watts), input voltage range (volts), LED drive current (milliamps), correlated color temperature (kelvins), color rendering index, effective projected area (square feet) and weight (pounds).

b) LED Driver data sheet – including information described in LED Driver Requirements Section III-D-3.

c) LED light source data sheet

d) Surge protection device data sheet - if applicable

C. Photometric Performance Data

If requested by the Chief Procurement Officer, the bidder shall provide photometric calculations, within fifteen (15) days of such request, that demonstrate the luminaire's photometric performance will meet or exceed the photometric requirements listed in this specification. The submitted lighting calculations must include point-by-point illuminance, luminance and veiling luminance data, as well as listings of all indicated averages and ratios. Photometric reports must include the following information and be in accordance with the standards listed below:

a) IES LM-79-08 photometric report that includes measured values for initial luminous flux, input power, correlated color temperature, and color rendering index.

b) ANSI/IES LM-63-02 electronic format photometric file that corresponds to the LM-79 report.

c) LM-63 photometric calculations that demonstrate compliance with the illumination requirements specified herein using the LM-63 file. Calculation grids and observer locations not specified herein must be in accordance with ANSI/IES RP-8-14.

d) IES TM-21-11 calculations that derive the lumen maintenance (lamp lumen depreciation or LLD) factor applied to photometric calculations specified herein.

- ANSI/IES LM-80-15 and in-situ temperature measurement testing

(ISTMT) reports containing data used in TM-21 calculations must also be submitted.

- TM-21 calculations must apply to the maximum LED case temperature from ISTMT, shall not extrapolate beyond six times the duration of available LM-80 test data, and must be submitted in the spreadsheet format of the ENERGY STAR TM-21 calculator (https://www.energystar.gov/products/spec/luminaires_specification_version_2_0_pd).

LM-79, ISTMT, and LM-80 reports must correspond directly to submitted luminaires, and must be produced by test laboratories that satisfy the Testing Laboratory Requirements of the Design Lights Consortium (www.designlights.org/content/QPL/ProductSubmit/LabTesting).

ISTMT must be conducted in accordance with the Design Lights Consortium Manufacturer's Guide (https://www.designlights.org/content/qpl/productsubmit).

ISTMT shall be conducted in an ambient temperature of 25 ± 5 °C. Ambient temperature variations above or below 25 °C shall be respectively subtracted from or added to temperatures recorded at points on the luminaire.

D. Safety Certification - file number indicating compliance with UL 1598. Applicable testing bodies are determined by the US Occupational Safety Health Administration (OSHA) as Nationally Recognized Testing Laboratories (NRTL) and include: CSA (Canadian Standards Association), ETL (Edison Testing Laboratory), and UL (Underwriters Laboratory).

E. Vibration Testing - the luminaire must comply with ANSI C136.31 at Vibration Test Level 1 (1.5 G).

F. Product Sample. If requested by the Chief Procurement Officer, a sample of the luminaire that the bidder proposes to provide must be submitted to the City within fifteen (15) days of such request. The sample must be a representative production unit and be supplied at no cost to the City.

C. Assembly.

Luminaire must be delivered completely assembled, wired, and ready for installation.

D. Warranty.

The luminaire manufacturer must warrant the performance and construction of luminaires to meet the requirements of this specification, and must warrant all parts, components and appurtenances against defects due to design, workmanship or material developing within a period of ten (10) years from the date of acceptance by the City.

- The inability of a luminaire to be dimmed will constitute a luminaire failure.
- Failure of 10% or more of the LED light sources (packages or arrays/modules) in a luminaire will constitute a luminaire failure.
- The warranty must apply for application on all of the City's existing electrical systems, both grounded and ungrounded. The luminaire must perform with the power provided by ComEd.

E. Manufacturing Experience and Capacity

The manufacturer must demonstrate at least a five year history of manufacturing LED roadway and outside area luminaires. The manufacturer must also demonstrate the capacity to supply the quantities required for the contract in a timely manner.

III. CONSTRUCTION

A. Cast Housing and Fitter

1. Material

a) Each housing and fitter must be cast aluminum, ASTM Grade 356, conforming to the Aluminum Association Standards for Aluminum Sand and Permanent Mold Castings, Washington, D.C., March 1980.

b) The housing and fitter must conform in detail and dimensions to the applicable portions of Electrical Standard Drawing 931.

c) Each casting must be die cast or made by the permanent mold process; sand castings will not be acceptable.

d) Minimum thickness will be 3/16", excluding the fitter attachment to the pole, and will be uniform within each casting and throughout all castings in an entire order. Inconsistencies in casting thickness will be cause for rejection of the entire lot.

2. Appearance

a) Castings will have smooth external surfaces free from protuberances, dents, cracks, or other imperfections marring their appearance. Welding or plugging of casting defects is prohibited.

3. Housing

a) The housing must enclose the LED array, electronic driver, terminal block, with provision for proper mounting of these parts.

b) The housing must be of such size and surface area, or must have "heat

sink" characteristics, such that all enclosed components will operate within their designed operating temperatures under expected service conditions.

4. Fitter

a) The fitter must be suitable for attachment over the end of a two inch (2") steel mast arm inserted against a built-in pipe stop. The slip-fitter must be designed to permit adjustment of not less than three (3) degrees above and below the axis of the mounting bracket to compensate for slight misalignment. The fitter attachment to the pole mast arm must provide the structural integrity to hold the luminaire firmly in place during the vibrations anticipated due to wind loading, passing elevated trains and heavily loaded vehicles. Two 3/8-16, stainless steel (type 304) U-shape bolts must be used to secure the fitter to the pole mast arm. A minimum of 3/4" thickness of metal will be provided where the U-bolts are inserted to minimize the possibility of stripping the threads when the hardware is tightened into place. The hardware must include 3/8" x 16 threaded, stainless steel bolts and nuts; four sets of nuts and washers must be provided where the cobra-head style leveling device and fitter attaches to mast arm. The U-bolts must be properly installed and torqued in accordance with the manufacturer's written installation instructions. The fitter must be securely threaded into the cast housing such that it will remain an integral part of the luminaire during the vibrations described above. The slip-fitter will contain an approved shield around the pipe entrance to block entry of birds.

B. Cast Housing and Fitter Painting

1. Oil and Grease Removal

a) All metal surfaces must be washed with an alkaline detergent to remove any oils or grease.

2. Chemical Pretreatment

a) The cleaned metal surfaces must be rinsed with de-ionized water
b) Treated with a hot, pressurized phosphate wash and sealer
c) Rinsed again with de-ionized water, and then dried by convection heat.

3. Exterior and Interior Coat

a) A thermosetting, weathering, polyester powder coat must be applied electrostatically to all cleaned and treated surfaces to a uniform four mil thickness in a one coat application.
b) This powder coat must be cured in a convection oven at a minimum 400ºF to form a high molecular weight fusion bonded finish.

4. Alternate Methods

a) 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

5. Durability

a) Both the exterior and interior coats must be capable of passing 1,000 hours of salt spray exposure as per ASTM B117 in a 5% Na Cl (by weight) solution at 95ºF and 95% relative humidity without blistering.
b) Before test, the panel must be scribed with an "X" down to bare metal.

6. Coating Measurement
a) 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" must not be less than 3.0 mils.

7. Color
a) Preferred color will be gloss black. A 4" square color chip sample must be submitted for approval prior to fabrication.
b) The chip sample must be of the same material as the capital, and must include the manufacturer's name and the manufacturer's color name as well.
c) The sample must also include any other information which will be required to purchase the same color for the poles and split pedestal bases.

C. Optical Assembly

1. Refractor

a) The refractor shall be pressed DR acrylic. It must be clear and free from imperfections.

b) It must contain prisms where necessary, and must be optically designed to redirect by refraction the light from the array and reflector to produce the desired light pattern.

c) The refractor must conform to that shown on the Electrical Standard Drawing 931.

d) The holder-door must be a precision, aluminum ASTM Grade 356 permanent mold casting which must be hinged to the luminaire housing and must open downward approximately 90 degrees to allow servicing.

e) The hinging arrangement must be of rugged construction with corrosion resistant hinge fittings.

f) The hinge must prevent the holder-door from disengaging and dropping in case it should swing open.

g) The door must also be connected to the housing with a stainless steel cable. The refractor must be securely held in the holder-door. The entire assembly should be easily disconnected for replacement. When closed, the holder-door must lock the assembly in precise optical alignment with the housing.

h) A sturdy, positive-acting, spring loaded latch will permit single-glove-handed release, and on closing, the holder-door must provide a definite snap action or visual indication that it is locked.

i) A silicone rubber, EPDM (ethylene propylene diene monomer), or EPR (ethylene propylene rubber) gasket must be fixed in place to seal the refractor door to the main housing.

j) A "breathing" filter of Fiberglass or other approved material must be incorporated in the reflector for sealed optical units. It must effectively filter out dirt and particle size contaminants.

D. Electrical Components

1. LED Optical Array.

a) The LED arrays shall be optimized for the required roadway photometrics. The arrays must be properly secured at the factory and must not require field adjustment for optimum photometric performance.

b) The optical assembly shall consist of the LED array, the refractor, the refractor holder-door, gasketing, and all associated items.

c) The LED optical assembly shall be rated IP66 for ingress protection for dust and water.

d) The optical unit as a whole must provide as similar as an IES Medium Cut-off Type II/III distribution.

2. Terminal Block

a) A terminal block of high grade molded plastic of the barrier or safety type must be mounted within the housing in a readily accessible location.

b) Terminal block wiring; all necessary terminals, pre-wired to all luminaire

components, must be provided.

c) Terminal block terminals must have copper plated or brass plated, clamp-type pressure connectors of an approved type for "line" connections, to accommodate wire sizes from #12 to #8 A.W.G.

d) Terminal block terminals for internal component connections must be either the screw-clamp or quick disconnect type.

3. LED Driver:

a) Voltage.
- The electronic driver must operate at an input voltage range of between 120 and 277 volts, 60 Hertz.
- It must automatically sense the input voltage and adjust the output accordingly.
- The City uses nominal input voltages of 120, 208, and 240 for street lighting.
- When operated at any supply voltage between 80 percent and 110 percent of its rated supply voltage and at rated input frequency, a driver shall provide current and/or voltage regulation that equals or exceeds the values specified by the manufacturer.

b) Electrical Safety. Luminaires must operate at or below the Low-Risk Level, as defined in Figure 18 of IEEE 1789-2015. This requirement must be satisfied across the dimming range.

c) Power Factor (PF). The power factor of the driver over the design range of input voltages specified above must be in accordance to ANSI C82.77-2014. PF must be ≥ 0.9.

d) Total Harmonic Distortion (THD). The driver input current must have specified THD in accordance to ANSI C82.77-2014. THD must be $\leq 32\%$.

e) Thermal Protection. The driver must be thermally protected to shut off when operating temperatures reach unacceptable levels.

f) Electromagnetic Interference. Luminaire must comply with the FCC radiation emission limits for Class B digital devices given at 47 CFR 15.109.

g) Electrical Transient Immunity:

- Dielectric Withstand Testing - luminaire must meet the performance requirements specified in ANSI C136.2-2015 for dielectric withstand, using the DC test level and configuration.

- Electrical Transient Immunity - luminaire must meet the performance requirements specified in ANSI C136.2-2015 for electrical transient immunity, using the Enhanced (10 kV / 5 kA) combination wave test level.

- Transient Immunity Testing Requirements:

  - During electrical transient immunity testing, the device under test (DUT) must: be connected to the power source through a series coupler/decoupler network (CDN), using a two-wire (hot or hot/neutral) connection between both the power supply and CDN input and the CDN output and DUT.

- If AC mains is used to power the DUT, the input waveform must be characterized and documented both before and after electrical transient immunity testing, with the DUT operating at rated full output.

- For Pre-Test DUT Characterization, the diagnostic measurements shall, at a minimum, include the following: real power, input current (RMS; Root-Means-Square), power factor, and current distortion factor (THD-I Total Harmonic Distortion) when operating at rated full output.

- Manufacturer must indicate on submittal form whether failure of the electrical transient immunity system can possibly result in disconnect of power to luminaire.

h) Dimming Capability. The driver must be capable of dimming. The dimming range must be 10% to 100% of full output. The digital lighting interface used for dimming must be 0-10 VDC as per the requirements of ANSI C136.41-2013. There must be a minimum of 100 dimming steps between the top and bottom of the dimming range. Wiring.

a) All components must be completely factory wired with non-fading, color coded leads. These leads must be insulated with an approved class of insulation and must be #16 AWG conductor at a minimum.

b) All wires within a single circuit path must be of the same size.

c) No wire-nut splicing will be allowed.

d) No unnecessary splices will be allowed.

e) Quick disconnects must be provided for all components.

f) All wires must be properly terminated.

4. Control Device Receptacle and Cap.

a) Twist-lock Receptacle for a control device that meets ANSI C136.41 must be mounted in the top of the housing or appropriate location with provision for proper positioning of the control device.

b) 7-pin Receptacle. The luminaire control receptacle must be fully prewired and compliant with ANSI C136.41.

c) 3-prong Shorting Cap that meets ANSI C136.10 must be provided.

d) Receptacle Wire Leads must all be properly terminated.

e) Receptacle repositioning. The receptacle must be able to be repositioned without the use of tools.

f) Control Devices Not Included in LED Specifications. Whereas specifications for control receptacles are included, specifications for control devices are not. The control device performance requirements are part of the lighting management system specifications in the Smart Lighting Project Technology specifications

5. Component Mounting.

All electrical components must be securely mounted in such manner that individual components can be easily maintained or replaced. Permanent straps or tie-wraps will not be permitted. The entire assembly should be easily disconnected and removed for replacement.

IV. PHOTOMETRIC REQUIREMENTS

A. Light Pollution.

To limit light pollution, the submitted luminaires must not emit any light above the horizon (0 lumens at angles ≥ 90° from luminaire nadir).

B. Lumen Maintenance.

1. LED arrays must deliver a minimum of 90% of initial lumen output at 36,000 hours of operation.

2. Light Loss Factor (LLF) < 1.0. Calculations for maintained values, i.e. LLF = LLD x LDD x LAT.

a) Lamp Lumen Depreciation (LLD) calculated at 60,000 hours as per Section II-B-3-d above,
b) Luminaire Dirt Depreciation (LDD) ≤0.90, and
c) Luminaire Ambient Temperature (LAT) ≤0.96

Luminaires with less than 10,000 hours of available LM-80 test data may be submitted for consideration but must be clearly indicated as such.

C. Color Attributes

1. Color Rendering Index (CRI) shall be no less than 65.

2. Nominal Correlated Color Temperature (CCT) shall be 3000K as defined by ANSI C78.377 and described below:

Manufacturer-Rated Nominal CCT (K)	Allowable IES LM-79 Chromaticity Values	
	Measured CCT (K)	Measured Duv
3000	2870 to 3220	-0.006 to 0.006

A. City of Chicago Typical Ornamental Lighting Contexts

ATTACHMENT A (below) lists the photometric performance requirements for luminaires used in the following typical municipal outdoor arterial ornamental lighting applications:

- Arterial Streets – two-sided opposite pole spacing
- Arterial Streets – two-sided staggered pole spacing

ATTACHMENT A – Photometric Performance Requirements

TYPICAL LIGHTING CONTEXT	ARTERIAL		
POLE CONFIGURATION*	OPPOSITE	STAGGERED	
RIGHT OF WAY (Width)	100 ft.	80 ft.	66 ft.
IES PAVEMENT CLASS	R3	R3	R3
STREET WIDTH (Curb to Curb)	80 ft.	60 ft.	48 ft.
LANES (Incl. Parking &Median)	7	6	4
PARKWAY (Width)	4 ft.	4 ft.	N/A
SIDEWALK (Width)	6 ft.	6 ft.	9 ft.
HEIGHT TO LUMINAIRE	30 ft.	30 ft.	30 ft.
MAST ARM LENGTH	8 ft.	8 ft.	8 ft.
POLE SETBACK (From Curb to Center of Pole)	3 ft.	3 ft.	3 ft.
IN-LINE POLE SPACING	100 ft.	150 ft.	175 ft.
LUMINAIRE REQUIREMENTS	OPPOSITE	STAGGERED	
Max Input Power - Default /Normal Luminance (Watts)	180	180	180
Default/Normal AVG. Luminance (cd/m^2)	≥1.7	≥1.7	≥1.7
AVG/MIN Uniformity Ratio	≤ 3:1	≤ 3:1	≤ 3:1
MAX/MIN Uniformity Ratio	≤ 5:1	≤ 5:1	≤ 5:1
MAX Veiling Luminance Ratio	≤ 0.3	≤ 0.3	≤ 0.3
AVG. Boosted Luminance (cd/m^2) [Add-Alternate]	≥2.5	≥2.5	≥2.5
SIDEWALK			
Default AVG. Horizontal Illuminance (fc)	≥0.50	≥0.50	≥0.50
AVG.MIN Uniformity Ratio (Horizontal Illuminance)	≤ 4:1	≤ 4:1	≤ 4:1
LIGHT TRESPASS RESTRICTIONS - (as measured in a vertical plane 10' beyond ROW ≤3' height)			
MAX Vertical Illuminance	≤ 0.3	≤ 0.30	≤ 0.30

ATTACHMENT B - Product Submittal Form

Lighting Context	**e.g. Arterial Ornamental Wide**			
Product Information Description	***Product Data (Summary)***			***Submittal Reference Document***
Luminaire Designation				
Luminaire Manufacturer				
Luminaire Model Number				
Luminous Flux – initial	lumens			
Luminaire input power—initial	watts			
Luminaire input power—maintained	watts			
Luminaire input voltage- nominal range	volts			
LED drive current - initial	milliamps			
LED drive current - maintained	milliamps			
CCT (correlated color temperature)	kelvin			
CRI (color rendering index)				
EPA (effective projected area) - nominal	sq. ft.			
Luminaire Weight - nominal	lbs.			
Control Interface	☐ ANSI C136.41, 7-pin			
LED Driver – dimming capability	☐ Dimmable, 0-10V	☐ Dimmable, DALI		
LED driver- rated life	years			
Electrical transient immunity ANSI C136.2 combination wave test level	☐ Basic (6kV/3kA)	☐ Enhanced (10kV / 5kA)	☐ Elevated (20kV/10kA)	
Vibration Test-ANSI C136.31	☐ Level 2			
Luminaire warranty period	years			
IES LM-80 test duration	hours			IES LM-80-15 report
LED lumen maintenance at 36,000 hours	%			TM-21 calculator
Max. LED case temperature	degrees Celsius			ISTMT report

ELECTRICAL SPECIFICATION 1612
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED APRIL 9, 2021

ROADWAY LED LUMINAIRE: ORNAMENTAL ACORN FOR ARTERIAL STREETS

I. SUBJECT

A. This specification states the requirements for an ornamental Acorn LED street light luminaire. The luminaire shall be for arterial street lighting. The overall shape of the luminaire shall be historic acorn. The LED luminaires will be integrated into a centralized lighting management system. The luminaire shall be mounted on a tenon at a mounting height of 14, 16 or 23 feet above grade and be similar to an IES Type II/III medium non-cutoff distribution. The luminaire will be used to provide roadway lighting for arterial streets.

II. GENERAL

A. References

American National Standards Institute (ANSI)

- ANSI C78.377-2015, "American National Standard for Electric Lamps—Specifications for the Chromaticity of Solid State Lighting (SSL) Products"
- ANSI C82.77-10-2014, "American National Standard for Lighting Equipment—Harmonic Emission Limits—Related Power Quality Requirements"
- ANSI C136.2-2015, "American National Standard for Roadway and Area Lighting Equipment—Dielectric Withstand and Electrical Transient Immunity Requirements"
- ANSI C136.10-2010, "American National Standard for Roadway and Area Lighting Equipment—Locking-Type Control Devices and Mating Receptacles—Physical and Electrical Interchangeability and Testing"
- ANSI C136.15-2015, "American National Standard for Roadway and Area Lighting Equipment—Luminaire Field Identification"
- ANSI C136.22-2004 (R2009, R2014), "American National Standard for Roadway and Area Lighting Equipment—Internal Labeling of Luminaires"
- ANSI C136.25-2013, "American National Standard for Roadway and Area Lighting Equipment—Ingress Protection (Resistance to Dust, Solid Objects and Moisture) for Luminaire Enclosures"
- ANSI C136.31-2015, "American National Standard for Roadway and Area Lighting Equipment—Luminaire Vibration"

- ANSI C136.37-2011, “American National Standard for Solid State Light Sources Used in Roadway and Area Lighting”
- ANSI C136.41-2013, “American National Standard for Roadway and Area Lighting Equipment–Dimming Control Between an External Locking Type Control and Ballast or Driver”
- ASTM B85/B85M-14, “Standard Specification for Aluminum-Alloy Die Castings”
- ASTM B117-16, “Standard Practice for Operating Salt Spray (Fog) Apparatus”
- ASTM D523-14, “Standard Test Method for Specular Gloss”
- ASTM D1654-08, “Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments”
- ASTM G154-12a, “Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials”

Illuminating Engineering Society of North America (IES)

- ANSI/IES LM-63-02, “Standard File Format for Electronic Transfer of Photometric Data”
- IES LM-79-08, “Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products”
- ANSI/IES LM-80-15, “IES Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays and Modules”
- ANSI/IES RP-8-14, “Roadway Lighting”
- IES TM-21-11 (with Addendum B), “Projecting Long Term Lumen Maintenance of LED Light Sources”

Institute of Electrical and Electronics Engineers (IEEE)

- IEEE Std 1789-2015, “IEEE Recommended Practices for Modulating Current in High-Brightness LEDs for Mitigating Health Risks to Viewers”

International Electrotechnical Commission (IEC)

- IEC 60929:2011 (with Amendment 1), “AC and/or DC-supplied electronic control gear for tubular fluorescent lamps - Performance requirements”

Underwriters Laboratories (UL)

- ANSI/UL 1598 (3rd Edition), "Luminaires”

B. Submittal Requirements:

The bidder shall submit the following information pertaining to the specified luminaire:

A. Completed ATTACHMENT B – Submittal Form

B. Product Data Sheets.

a) Luminaire data sheets – including summary product description, dimensioned outline drawings, and nominal characteristics including but not limited to: initial luminous flux (lumens), input power (watts), input voltage range (volts), LED drive current (milliamps), correlated color temperature (kelvins), color rendering index, effective projected area (square feet) and weight (pounds).

b) LED Driver data sheet – including information described in LED Driver Requirements Section III-D-3.

c) LED light source data sheet

d) Surge protection device data sheet - if applicable

C. Photometric Performance Data

If requested by the chief Procurement Officer, the bidder shall provide photometric calculations, within fifteen (15) days of such request, that demonstrate the luminaire's photometric performance will meet or exceed the photometric requirements listed in this specification. The submitted lighting calculations must include point-by-point illuminance, luminance and veiling luminance data, as well as listings of all indicated averages and ratios. Photometric reports must include the following information and be in accordance with the standards listed below:

a) IES LM-79-08 photometric report that includes measured values for initial luminous flux, input power, correlated color temperature, and color rendering index.

b) ANSI/IES LM-63-02 electronic format photometric file that corresponds to the LM-79 report.

c) LM-63 photometric calculations that demonstrate compliance with the illumination requirements specified herein using the LM-63 file. Calculation grids and observer locations not specified herein must be in accordance with ANSI/IES RP-8-14.

d) IES TM-21-11 calculations that derive the lumen maintenance (lamp lumen depreciation or LLD) factor applied to photometric calculations specified herein.

- ANSI/IES LM-80-15 and in-situ temperature measurement testing (ISTMT) reports containing data used in TM-21 calculations must also be submitted.

- TM-21 calculations must apply to the maximum LED case temperature from ISTMT, shall not extrapolate beyond six times the duration of available LM-80 test data, and must be submitted in the spreadsheet format of the ENERGY STAR TM-21 calculator (https://www.energystar.gov/products/spec/luminaires_specification_version_2_0_pd).

LM-79, ISTMT, and LM-80 reports must correspond directly to submitted luminaires, and must be produced by test laboratories that satisfy the Testing Laboratory Requirements of the Design Lights Consortium (www.designlights.org/content/QPL/ProductSubmit/LabTesting).

ISTMT must be conducted in accordance with the Design Lights Consortium Manufacturer's Guide (https://www.designlights.org/content/qpl/productsubmit).

ISTMT shall be conducted in an ambient temperature of 25 ± 5 °C. Ambient temperature variations above or below 25 °C shall be respectively subtracted from or added to temperatures recorded at points on the luminaire.

D. Safety Certification - file number indicating compliance with UL 1598. Applicable testing bodies are determined by the US Occupational Safety Health Administration (OSHA) as Nationally Recognized Testing Laboratories (NRTL) and include: CSA (Canadian Standards Association), ETL (Edison Testing Laboratory), and UL (Underwriters Laboratory).

E. Vibration Testing - the luminaire must comply with ANSI C136.31 at Vibration Test Level 1 (1.5 G).

F. Product Sample. Upon a request from the Chief Procurement Officer, a sample of the luminaire that the bidder proposes to submit must be delivered to the City, within fifteen (15) days of such a request.. Sample must be representative production unit and be supplied at no cost to the City.

C. Assembly.

Luminaire must be delivered completely assembled, wired, and ready for installation.

D. Warranty.

The luminaire manufacturer must warrant the performance and construction of luminaires to meet the requirements of this specification, and must warrant all parts, components and appurtenances against defects due to design, workmanship or material developing within a period of ten (10) years from the date of acceptance by the City.

- The inability of a luminaire to be dimmed will constitute a luminaire failure.
- Failure of 10% or more of the LED light sources (packages or arrays/modules) in a luminaire will constitute a luminaire failure.
- The warranty must apply for application on all of the City's existing electrical systems, both grounded and ungrounded. The luminaire must be operable with the

power conditions supplied by ComEd.

E. Manufacturing Experience and Capacity

The manufacturer must demonstrate at least a five year history of manufacturing LED roadway and outside area luminaires.The manufacturer must also demonstrate the capacity to supply the quantities required for the contract in a timely manner.

III. CONSTRUCTION

A. Capital and Finial

1. Material

a) Each capital and finial shall be cast aluminum conforming to American Die casting Standard ADC-1-C9-83 grade 380.

b) The capital shall fit over a 3" high by 3" O.D. tenon.

c) The capital attachment to the tenon shall provide the structural integrity to hold the luminaire firmly in place during the vibrations anticipated due to passing heavily loaded vehicles, wind loading, and inclement weather.

d) A minimum of 3/16" thickness of metal must be provided where the set screws are inserted to minimize the possibility of stripping the threads when the set screws are tightened into place.

e) The set screws must be 5/16-18 stainless steel hex head screws. A minimum of three (3) set screws must be provided, evenly spaced at 120° apart.

f) The finial shall be securely attached to the acorn globe such that it will remain in place during the vibrations described above.

g) The casting must have smooth external surfaces free from protuberances, dents, cracks or other imperfections marring their appearance. Welding or plugging of casting defects is prohibited.

h) Each casting must be die cast or made by the permanent mold process; sand castings will not be acceptable.

i) Minimum thickness will be 3/16", and will be uniform within each casting and throughout all castings in an entire order. Inconsistencies in casting thickness will be cause for rejection of the entire lot.

2. Appearance

a) The capital shall conform in appearance to that shown on Electrical Standard

Drawing Number 912.

b) Similar designs must be approved by the Commissioner. The Commissioner's decision of what constitutes a similar design will be final.

B. Cast Housing and Fitter Painting

1. Oil and Grease Removal

a) All metal surfaces must be washed with an alkaline detergent to remove any oils or grease.

2. Chemical Pretreatment

a) The cleaned metal surfaces must be rinsed with de-ionized water
b) Treated with a hot, pressurized phosphate wash and sealer
c) Rinsed again with de-ionized water, and then dried by convection heat.

3. Exterior and Interior Coat

a) A thermosetting, weathering, polyester powder coat must be applied electrostatically to all cleaned and treated surfaces to a uniform four mil thickness in a one coat application.
b) This powder coat must be cured in a convection oven at a minimum 400ºF to form a high molecular weight fusion bonded finish.

4. Alternate Methods

a) 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

5. Durability

a) Both the exterior and interior coats must be capable of passing 1,000 hours of salt spray exposure as per ASTM B117 in a 5% Na Cl (by weight) solution at 95ºF and 95% relative humidity without blistering.
b) Before test, the panel must be scribed with an "X" down to bare metal.

6. Coating Measurement

a) 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" must not be less than 3.0 mils.

7. Color

a) Preferred color will be gloss black. A 4" square color chip sample must be submitted for approval prior to fabrication.

b) The chip sample must be of the same material as the capital, and must include the manufacturer's name and the manufacturer's color name as well.
c) The sample must also include any other information which will be required to purchase the same color for the masts, mast arms and split pedestal bases.

C. Optical Assembly

1. Acorn Globe and Reflector

a) The Globe shall be constructed of clear, V825 HID acrylic utilizing a slip-fit 1/2" overlap, two piece which eliminates a "butt-glue" seam appearance.

b) The Globe must conform to that shown on Electrical Standard Drawing 912.

c) The bottom optical section of the globe must have a neck opening of 7-1/4" at the smallest diameter and an outside dimension of 8" at the bottom; be a minimum of 12-3/4" in height and 16 1/2" in width at the top.

d) The top section of the globe must be "Victorian" in appearance; a minimum of 13" in height and 16.313" in width with 100 horizontal prisms to evenly diffuse light. If so requested, a full top reflector of the same diameter as the globe shall be installed between the halves and secured to the globe. The top and bottom sections shall be secured in a slip-fit overlap design using four #10 -24 x 5/8 stainless steel pan head screws with four aluminum nutserts providing a mechanical lock. In addition, a sealant must be applied to the two halves to provide a dust-proof seal.

e) The globe shall be mounted with four 5/16-18 hex head, stainless steel bolts with stop nuts mounted into the die cast fixture housing.

f) The hex head bolts must securely contact an aluminum globe neck ring connected to the acorn globe. The globe must be clearly marked and keyed so that it will be properly installed to provide the required house side/street side photometrics. The mounting must afford the rigidity necessary to prevent the globe from twisting or rattling when subjected to the vibrating forces of passing elevated trains or heavily loaded vehicles. The mounting must not preclude any globe from being mutually interchangeable with any other globe intended for this function.

g) A top reflector and a house-side reflector shall be provided, if requested.

h) The reflectors shall be mounted to a removable bracket.

i) The small dome shaped top reflector, approximately 6.5 inches in diameter and 3 inches deep shall be mounted on the bracket and attached by a spring clamp, or other suitable means.

j) The side reflector shall be mounted to the same bracket. The reflectors shall be constructed of aluminum and polished to a high specular finish. Reflectance of the reflecting surfaces shall not be less than 75%. Measurements shall be made with a reflectometer using the fiber-optic method.

D. Electrical Components

1. LED Optical Array.

a) The LED arrays shall be optimized for the required roadway photometrics. The arrays must be properly secured at the factory and must not require field adjustment for optimum photometric performance.

b) The optical assembly shall consist of the LED array, the refractor, the refractor holder-door, gasketing, and all associated items.

c) The LED optical assembly shall be rated IP66 for ingress protection for dust and water.

d) The optical unit as a whole must provide as similar as an IES Medium Cut-off Type II/III distribution.

2. Terminal Block

a) A terminal block of high grade board of molded phenolic plastic shall be mounted to the capital in a readily accessible location.

b) Terminal block wiring; all necessary terminals, pre-wired to all luminaire components, must be provided.

c) Terminal block terminals must have copper plated or brass plated, clamp-type pressure connectors of an approved type for "line" connections, to accommodate wire sizes from #12 to #8 A.W.G.

d) Terminal block terminals for internal component connections must be either the screw-clamp or quick disconnect type.

3. LED Driver:

a) <u>Voltage.</u>
- The electronic driver must operate at an input voltage range of between 120 and 277 volts, 60 Hertz.
- It must automatically sense the input voltage and adjust the output accordingly.
- The City uses nominal input voltages of 120, 208, and 240 for street lighting.

- When operated at any supply voltage between 80 percent and 110 percent of its rated supply voltage and at rated input frequency, a driver shall provide current and/or voltage regulation that equals or exceeds the values specified by the manufacturer.

b) Electrical Safety. Luminaires must operate at or below the Low-Risk Level, as defined in Figure 18 of IEEE 1789-2015. This requirement must be satisfied across the dimming range.

c) Power Factor (PF). The power factor of the driver over the design range of input voltages specified above must be in accordance to ANSI C82.77-2014. PF must be ≥ 0.9.

d) Total Harmonic Distortion (THD). The driver input current must have specified THD in accordance to ANSI C82.77-2014. THD must be $\leq$32%.

e) Thermal Protection. The driver must be thermally protected to shut off when operating temperatures reach unacceptable levels.

f) Electromagnetic Interference. Luminaire must comply with the FCC radiation emission limits for Class B digital devices given at 47 CFR 15.109.

g) Electrical Transient Immunity:

- Dielectric Withstand Testing - luminaire must meet the performance requirements specified in ANSI C136.2-2015 for dielectric withstand, using the DC test level and configuration.

- Electrical Transient Immunity - luminaire must meet the performance requirements specified in ANSI C136.2-2015 for electrical transient immunity, using the Enhanced (10 kV / 5 kA) combination wave test level.

- Transient Immunity Testing Requirements:

  - During electrical transient immunity testing, the device under test (DUT) must: be connected to the power source through a series coupler/decoupler network (CDN), using a two-wire (hot or hot/neutral) connection between both the power supply and CDN input and the CDN output and DUT.

- If AC mains is used to power the DUT, the input waveform must be characterized and documented both before and after electrical transient immunity testing, with the DUT operating at rated full output.

- For Pre-Test DUT Characterization, the diagnostic measurements shall, at a minimum, include the following: real power, input current (RMS; Root-Means-Square), power factor, and current distortion factor (THD-I Total Harmonic Distortion) when operating at rated full output.

- Manufacturer must indicate on submittal form whether failure of the electrical transient immunity system can possibly result in disconnect of power to luminaire.

h) Dimming Capability. The driver must be capable of dimming. The dimming range must be 10% to 100% of full output. The digital lighting interface used for dimming must be 0-10 VDC as per the requirements of ANSI C136.41-2013. There must be a minimum of 100 dimming steps between the top and bottom of the dimming range.

4. Wiring.

a) All components must be completely factory wired with non-fading, color coded leads. These leads must be insulated with an approved class of insulation and must be #16 AWG conductor at a minimum.

b) All wires within a single circuit path must be of the same size.

c) No wire-nut splicing will be allowed.

d) No unnecessary splices will be allowed.

e) Quick disconnects must be provided for all components.

f) All wires must be properly terminated.

5. Component Mounting.

All electrical components must be securely mounted in such manner that individual components can be easily maintained or replaced. Permanent straps or tie-wraps will not be permitted. The entire assembly should be easily disconnected and removed for replacement.

IV. PHOTOMETRIC REQUIREMENTS

A. Light Pollution.

To limit light pollution, the submitted luminaires must not emit any light above the horizon (0 lumens at angles ≥ 90° from luminaire nadir).

B. Lumen Maintenance.

1. LED arrays must deliver a minimum of 90% of initial lumen output at 36,000 hours of operation.

2. Light Loss Factor (LLF) < 1.0. Calculations for maintained values, i.e. LLF = LLD x LDD x LAT.

a) Lamp Lumen Depreciation (LLD) calculated at 60,000 hours as per Section II-B-3-d above,

b) Luminaire Dirt Depreciation (LDD) ≤0.90, and

c) Luminaire Ambient Temperature (LAT) ≤0.96

Luminaires with less than 10,000 hours of available LM-80 test data may be submitted for consideration but must be clearly indicated as such.

C. Color Attributes

1. Color Rendering Index (CRI) shall be no less than 65.

2. Nominal Correlated Color Temperature (CCT) shall be 3000K as defined by ANSI C78.377 and described below:

Manufacturer-Rated Nominal CCT (K)	Allowable IES LM-79 Chromaticity Values	
	Measured CCT (K)	Measured Duv
3000	2870 to 3220	-0.006 to 0.006

A. City of Chicago Typical Ornamental Lighting Contexts

ATTACHMENT A (below) lists the photometric performance requirements for luminaires used in the following typical municipal outdoor arterial ornamental lighting applications:

- Arterial Streets – two-sided opposite pole spacing
- Arterial Streets – two-sided staggered pole spacing

ATTACHMENT A – Photometric Performance Requirements

TYPICAL LIGHTING CONTEXT	ARTERIAL		
POLE CONFIGURATION*	OPPOSITE	STAGGERED	
RIGHT OF WAY (Width)	80 ft.	66 ft.	66 ft.
IES PAVEMENT CLASS	R3	R3	R3
STREET WIDTH (Curb to Curb)	60 ft.	48 ft.	48 ft.
LANES (Incl. Parking &Median)	6	4	4
PARKWAY (Width)	4 ft.	N/A	N/A
SIDEWALK (Width)	6 ft.	9 ft.	9 ft.
HEIGHT TO LUMINAIRE	23 ft.	23 ft.	16 ft.
MAST ARM LENGTH	1ft.	1ft.	1ft.
POLE SETBACK (From Curb to Center of Pole)	4ft.	4ft.	4ft.
IN-LINE POLE SPACING	125 ft.	200 ft.	X?x ft.
LUMINAIRE REQUIREMENTS	OPPOSITE	STAGGERED	
Max Input Power - Default /Normal Luminance (Watts)	180	180	180
Default/Normal AVG. Luminance (cd/m^2)	≥1.7	≥1.7	≥1.7
AVG/MIN Uniformity Ratio	≤ 3:1	≤ 3.5:1	≤ 3.5:1
MAX/MIN Uniformity Ratio	≤ 5:1	≤ 6:1	≤ 6:1
MAX Veiling Luminance Ratio	≤ 0.5	≤ 0.5	≤ 0.5
AVG. Boosted Luminance (cd/m^2) [Add-Alternate]	≥2.5	≥2.5	≥2.5
SIDEWALK			
Default AVG. Horizontal Illuminance (fc)	≥0.50	≥0.50	≥0.50
AVG.MIN Uniformity Ratio (Horizontal Illuminance)	≤ 4:1	≤ 4:1	≤ 4:1
LIGHT TRESPASS RESTRICTIONS - (as measured in a vertical plane 10' beyond ROW ≤3' height)			
MAX Vertical Illuminance	≤ 0.3	≤ 0.30	≤ 0.30

ATTACHMENT B - Product Submittal Form

Lighting Context	**e.g. Arterial Ornamental Wide**			
Product Information Description	***Product Data (Summary)***			***Submittal Reference Document***
Luminaire Designation				
Luminaire Manufacturer				
Luminaire Model Number				
Luminous Flux – initial	lumens			
Luminaire input power—initial	watts			
Luminaire input power—maintained	watts			
Luminaire input voltage- nominal range	volts			
LED drive current - initial	milliamps			
LED drive current - maintained	milliamps			
CCT (correlated color temperature)	kelvin			
CRI (color rendering index)				
EPA (effective projected area) - nominal	sq. ft.			
Luminaire Weight - nominal	lbs.			
Control Interface	☐ ANSI C136.41, 7-pin			
LED Driver – dimming capability	☐ Dimmable, 0-10V	☐ Dimmable, DALI		
LED driver- rated life	years			
Electrical transient immunity ANSI C136.2 combination wave test level	☐ Basic (6kV/3kA)	☐ Enhanced (10kV / 5kA)	☐ Elevated (20kV/10kA)	
Vibration Test-ANSI C136.31	☐ Level 2			
Luminaire warranty period	years			
IES LM-80 test duration	hours			IES LM-80-15 report
LED lumen maintenance at 36,000 hours	%			TM-21 calculator
Max. LED case temperature	degrees Celsius			ISTMT report

ELECTRICAL SPECIFICATION 1617
DIVISION OF ENGINEERING
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
SEPTEMBER 16, 2019

ACCESSIBLE PEDESTRIAN SIGNAL

SUBJECT

1. This specification states the requirements for an integrated accessible pedestrian signal assembly which will include a vibrotactile push-button with arrow, a speaker, a sign, and housing. This assembly will provide non-visual walk information for persons without sight or with low vision. The walk indications shall be both audible and vibrotactile. This assembly can be used for either actuated pedestrian signal crossings or for non-actuated pedestrian signal crossings.

GENERAL

2. (a) Specifications. The accessible pedestrian signal (APS) assembly must conform in detail to the requirements herein stated, and to the latest requirements of the Manual on Uniform Traffic Control Devices (MUTCD). The APS must also meet the most recent requirements of the Americans with Disabilities Act (ADA).

(b) Acceptance. APS assemblies not conforming to this specification will not be accepted.

(c) Bidders Submittal. Bidders must submit with their bids detailed specifications and any shop drawings that describe the physical appearance and the functionality of the APS.

(d) Sample. One complete APS assembly of the manufacture intended to be furnished must be submitted within fifteen (15) business days upon request of the Chief Procurement Officer.

(e) Warranty. The manufacturer must warrant the APS against defects due to design, workmanship, and material, for a period of five years from the date of acceptance by the City. If any assembly fails to properly function within this period, the manufacturer will replace the assembly, free of charge to the city, including shipping.

HOUSING

3. (a) The housing shall be cast aluminum. It shall be vandal resistant. The housing shall contain the speaker and the push-button, and be able to accommodate a 9 inch by 12 inch sign. The housing shall have a hole in the back to accommodate cable. The housing shall be mounted to a bracket with stainless steel screws.

(b) A cast aluminum mounting bracket shall be supplied. The mounting bracket will be manufactured to be mounted onto a tubular shaped pole or post using two 3/4 inch steel bands (0.03 inches thick) or two stainless steel screws. The mounting bracket shall accept the APS housing.

(c) The housing and bracket shall be powder coated Gloss Black with an enamel.

ELECTRICAL

4. (a) The APS shall operate on 12 volt DC.

(b) A separate power supply shall be provided. The power supply will have its own housing and be able to be mounted in the WALK/DONT WALK signal compartment.

(c) The power supply shall accept 120 volt ac input. There will be two inputs (WALK, DONT WALK) that will accept 89VAC to 250VAC at 120 VAC nominal, 27 watt maximum per input. Output shall be a maximum of 16VDC and 1.6 amps.

(d) An MOV rated at 5 joules shall provide electrical protection. Each input shall be fused at 1.5 amps.

(e) There shall be four input wires and four output wires. These wires shall be identified on the power supply: WALK, DONT WALK, NEUTRAL, and GROUND. The input wires shall be long enough to be terminated in the signal compartment. The output wires on the power supply shall have a single quick disconnect plug.

(f) The push-button switch contacts must be normally open and must be closed when the push-button is pressed, restoring immediately to a normal open position when released. The switch must be electrically insulated from the housing. The push-button output rating shall be 36VAC/DC, 100mA.

PUSH-BUTTON

5. (a) The push-button must meet ADA requirements and the requirements of the MUTCD (Chapter 4E.11-4E.12).

(b) The push-button must have a raised tactile arrow on its surface. The arrow must be adjustable, so that it can face in the direction of the associated crosswalk. The arrow will vibrate during the associated WALK interval.

(c) If there is an actuated walk, pushing the button will send a request to the controller.

SOUND

6. (a) All sounds generated by the APS must meet the requirements of the MUTCD (Chapter 4E.11-4E.12).

(b) Sound levels must be able to be manually adjusted. Sound levels must be in the 30dB to 90dB range.

(c) The APS must include an option for automatic sound adjustment due to ambient sound levels.

(d) The APS shall have a push-button locator "click" tone during DONT WALK and flashing DONT WALK intervals.

(e) The APS shall have two options for the WALK interval. The APS shall generate a rapid "click" tone during the WALK interval or shall have a programmable voice message during the WALK interval.

(f) When the push-button is pushed during the DONT WALK or flashing DONT WALK, the APS will respond with a voice message, either "wait" or another programmed voice message.

SIGN

7. (a) A 9" by 12" reflective sign that can be mounted to the housing back-plate shall be supplied.

(b) The sign shall be an R10-2, "CROSS ONLY ON WALK (symbol) SIGNAL", an R10-3, "PUSH BUTTON FOR WALK (symbol)", or another sign as specified in the order or contract. Each sign shall contain a message in Braille meeting the requirements of the ADA (Americans with Disabilities Act).

ENVIRONMENT

8. (a) The APS shall function correctly within the temperature range of -34ºC and +74ºC.

(b) The APS shall function correctly up to 100% non-condensing humidity.

(c) The APS shall function correctly under the power conditions from Commonwealth Edison.

PACKAGING

9. (a) General. The APS must be shipped fully assembled and ready for installation. Each assembly must be individually wrapped and boxed so that the assembly is not damaged in shipment.

(b) Labeling. Each box must be labeled in 3/8 inch high letters " ACCESSIBLE PEDESTRIAN SIGNAL". The City Commodity Code, contract number, manufacturer, and date of manufacture must be clearly labeled on the box.

ELECTRICAL SPECIFICATION 1620
DIVISION OF ELECTRICAL OPERATIONS
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
MARCH 23, 2022

FIELD CABINET INTEGRATION EQUIPMENT AND DETECTION PROCESSOR WITH VIDEO CAMERA

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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 complaint.
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

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.

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 for cable runs exceeding standard Ethernet distance.

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. CO_2 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.

ELECTRICAL SPECIFICATION 1621
DIVISION OF ELECTRICAL OPERATIONS
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
DECEMBER 20, 2020

MANAGED ETHERNET SWITCH FOR TRAFFIC SIGNALS

1. SUBJECT

This specification states the requirements for a managed Ethernet switch to be used to connect various traffic signal devices at an intersection and prioritize and control communications between these devices. The switch shall be programmable (managed). The switch shall be physically located in a traffic signal control cabinet.

2. GENERAL

2.1 Specifications. The switch shall conform in detail to the requirements herein stated and to the latest referenced specifications of the following organizations:

Institute of Electrical and Electronics Engineers (IEEE)
International Electromechanical Commission (IEC)
National Electrical Manufacturers Association (NEMA)
Underwriters Laboratories (UL)

2.2 Acceptance. An Ethernet switch not conforming to this specification will not be accepted.

2.3 Sample. If requested by the Chief Procurement Officer, a sample of the switch 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.

2.4 Warranty. The manufacturer shall warrant the Ethernet switch against defects in material and workmanship for a period of five (5) years after City acceptance. The warranty shall include software updates and phone support, Monday through Friday, 7:00 AM to 7:00 PM. The manufacturer's local distributor shall provide a replacement of any failed switch at no cost to the City.

3. ENVIRONMENTAL

3.1 The Ethernet switch shall be suitable for installation in an outdoor cabinet without the need for special environmental conditioning equipment.

3.2 The Ethernet switch shall be an environmentally hardened switch compliant with IEEE 802.3af and IEEE 802.3at (10/100/1000 Mbps).

3.3 The Ethernet switch shall be capable of operating over an ambient temperature range of -40ºC to +75ºC without the use of external or internal cooling fans in accordance with IEC 60068-2-1 and IEC 60068-2-2.

3.4 The Ethernet switch shall be capable of operating properly in relative humidity conditions of up to 95% non-condensing at 55ºC in accordance with IEC 60068-2-30.

3.5 The Ethernet switch shall meet the environmental requirements of traffic control equipment in accordance with NEMA TS2 (2003) Section 2: Environmental Requirements, including NEMA TS2 2003 Section 2.2.8.

3.6 The manufacturer shall provide written evidence of independent testing verifying performance in compliance with these requirements.

3.7 The Ethernet switch shall be capable of operating properly when exposed to radiated electric fields of up to 10V/m continuously and magnetic fields of up to 40A/m continuously.

3.8 The Ethernet switch shall comply with the Electromagnetic Interference (EMI) immunity requirements given in IEC 61850-3 and IEEE 1613 and with the FCC Paragraph 15 Class A requirements.

3.9 The Ethernet switch shall pass the minimum Electromagnetic Compatibility (EMC) immunity requirements of EN61800-3, the IEC standard for adjustable speed electrical power drive systems.

3.10 The Ethernet switch shall comply with the electrical safety requirements for IT equipment of UL 60950.

3.11 The Ethernet switch shall comply with the atmospheric, vibration, shock, and bump requirements outlined in Table 1. The compliance shall be demonstrated by type withstands tests (i.e. type tests) as outlined in the table and summarized in a Type Test Report per the test report requirements of each of the standards given in the table.

TABLE 1. Environmental Tests

Test	Description		Test Level	Severity
IEC 60068-2-1	Cold Temp	Test Ad	-40ºC, 16 hours	N/A
IEC 60068-2-2	Dry Heat	Test Bd	+85ºC, 16 hours	N/A
IEC 60068-2-30	Humidity	Test Db	95% non-condensing, 55ºC, 6 cycles	N/A
IEC 60255-21-1	Vibration		2g@ 10-150Hz	Class 2
IEC 60255-21-2	Shock		30g @ 11ms	Class 2

4. PORT REQUIREMENTS

4.1 The Ethernet switch shall have a minimum of:

1. 8 - 10/100/1000Base TX ports. Four of these ports shall be POE+.
2. 3 - 10/1000Base FX small form pluggable (SFP) ports

4.2 All fiber optic link ports shall be capable of multimode or single mode.

4.3 The Ethernet switch shall support the following requirements and options:

1. 10/100/1000Base TX POE ports:
   a. RJ45 connectors
   b. Cable type: Category 5, unshielded twisted pair (CAT5 UTP), or better
   c. Segment length: 100m
   d. Auto-negotiation support (10/100Mbps) (IEEE 802.3)
   e. Auto MDI/MDIX crossover capability
   f. TVS (transient voltage suppression) between Line ±, Line ±ground, to protect the circuitry

g. Full duplex operation (IEEE 802.3x)

2. SFP modules shall be either single mode or multimode, as required.

a. Multimode:

1. LC connectors
2. 2 fiber
3. Optical Characteristics: 1300/1310/850 nm
4. Supports 62.5/125 µm multimode fiber
5. Optical power budget: mimimum 34.5dB @1310nm
6. Full duplex operation (IEEE 802.3x)
7. Cable distance: 2km

b. Single Mode:

1. LC connectors
2. 2 fiber
3. Optical Characteristics: 1310/1550 nm
4. Supports 9/125µm single mode fiber
5. Optical power budget: minimum 34.5dB @1310nm
6. Full duplex operation (IEEE 802.3x)
7. Cable distance: 40km

5. NETWORK REQUIREMENTS

5.1 The Ethernet switch shall support automatic address learning of up to 8000 MAC addresses.

5.2 The Ethernet switch shall support the following advanced layer 2 functions:

1. IEEE 802.1Q VLAN, with support for up to 256 VLANs
2. IEEE 802.1 p priority queuing
3. IEEE 802.1w rapid spanning tree protocol (RSTP)
4. IEEE 802.1Q-2005 MSTP (formerly 802.1s)
5. IEEE 802.1Q-VLAN tagging
6. IEEE 802.3x flow control

7. IEEE 802.3ad-Link Aggregation Control Protocol (LACP)

8. IGMPv3 multicast groups, 128 for each VLAN

9. Port Rate Limiting (user defined)

10. Configuration via test file which can be modified through standard text editor

11. DHCP Option 82

12. 20 Gbps full duplex bandwidth12 - 10/100/1000Base TX ports

5.3 The Ethernet switch shall provide the following network management functions:

1. SNMPv1, SNMPv2c, SNMPv3

2. RMON

3. GVRP

4. Port Mirroring

5. 802.1x port security

6. SSL – Secure Socket Layer

7. SSH – Secure Shell

8. TACACS+

9. TFTP

10. Network Time Protocol (NTP)

11. Simple Network Time Protocol (SNTP)

12. Management via web or Telnet

13. Tracing operation of protocols including but not be limited to the following: STP, MAC, IGMP

6. PROGRAMMABLE CRITICAL FAILURE RELAY

6.1 The Ethernet switch shall provide a programmable critical failure out relay that may be configured to activate upon critical error detection such as loss of link or detection of critical system errors.

6.2 The programmable critical failure out relay function shall be user enabled and programmable.

6.3 The output contacts shall be available in a Form-C configuration .

7. POWER SUPPLY

7.1 The Ethernet switch shall be supplied with provisions for operation at the following power supply inputs, 85 to 264 VAC (50/60Hz).

7.2 The power supply shall be internal to the Ethernet switch and shall have isolation.

7.3 A power cord of not less than 5 feet in length shall be supplied.

7.4 The Ethernet switch shall require no more than 27W of power with allowed increases for POE+ ports.

8. MOUNTING REQUIREMENTS

The Ethernet switch shall provide options for DIN Rail mounting or panel mounting via brackets. All mounting hardware shall be included.

9. SHIPPING

Each Ethernet switch and each SFP module shall be individually wrapped and boxed so that the items are not damaged in shipment. Each box must be labeled indicating the contents. The manufacturer and model numbers must be prominently displayed.

ELECTRICAL SPECIFICATION 1622
DIVISION OF ELECTRICAL OPERATIONS
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
DECEMBER 20, 2020

CELLULAR MODEM FOR TRAFFIC SIGNALS

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1. SUBJECT

This specification states the requirements for a cellular modem to be used as a wireless cellular two-way communication link between the traffic signal controller, video detection camera, and other traffic devices at an intersection and a remote computer or computers. The cellular modem will allow monitoring of the intersection controller, real time video, traffic counts, etc. Remote programming of the modem, the controller, video detection, and other traffic equipment shall also be provided. The modem shall be physically located in a traffic signal control cabinet.

2. GENERAL

2.1 Specifications. The modem shall conform in detail to the requirements herein stated and to the latest referenced specifications of the following organizations:

Institute of Electrical and Electronics Engineers (IEEE)
International Electromechanical Commission (IEC)
National Electrical Manufacturers Association (NEMA)
Underwriters Laboratories (UL)

2.2 Acceptance. The modem model shall be approved by the selected wireless carrier for use on their network. A modem not conforming to this specification will not be accepted.

2.3 Sample. If requested by the Chief Procurement Officer, a sample of the modem 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.

2.4 Warranty. The manufacturer shall warrant the modem against defects in material and workmanship for a period of five (5) years after City

acceptance. The manufacturer shall provide a replacement of any failed modem at no cost to the City.

2.5 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.

2.6 License.

1. The modem 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. Written evidence of the transfer shall be certified by an authorized representative of the software vendor and provided to the City.
6. The software license shall grant the City full use of the Web-based software including access to the data collected by the modem. The capabilities of the software may be enhanced but shall not be reduced.

2.7 Documentation. The modem shall include the manufacturer's installation and operations manuals in hardcopy and electronic PDF formats.

3. GENERAL FUNCTIONS

3.1 Support Virtual Private Network (VPN) connections

3.2 Support firewall capabilities, such as, Internet Protocol (IP) block/allow listings

3.3 Provide an "always-on" connection, without dialing

3.4 Support local and remote management

3.5 Domain name addressable

3.6 Port Filtering

3.7 Generic Routing Encapsulation (GRE) Tunneling

3.8 IP Filtering

3.9 Media Access Control (MAC) Address Filtering

3.10 SIM card shall have a static IP address assigned by DoIT, and shall be provisioned on the City's cellular provider's (currently Verizon) private network.

4. PORT REQUIREMENTS

4.1 Modem transceiver shall support full duplex operation.

4.2 The modem shall be static IP addressable.

4.3 Frequency Band and Cellular Network Interface.

1. Fourth Generation (4G) Long Term Evolution (LTE) models:

    a. Tri-band support for 700/1900/2100 megahertz (MHz)

    b. Backward compatible with: evolved High Speed Packet Access (HSPA+), High Speed Packet Access (HSPA), Enhanced Data-rates for GSM Evolution (EDGE), and General Packet Radio Service (GPRS).

    c. LTE auto-fallback to GSM / HSPA.

2. 3G HSPA+ models:

    a. Tri-band support for 850/1900/2100 MHz or quad-band support for 850/900/1800/1900 MHz

    b. Backward compatible with: HSPA, universal mobile telecommunications system (UMTS), EDGE, GPRS, and Global System for Mobile communications (GSM).

5. ETHERNET INTERFACES

5.1 Support Transmission Control Protocol (TCP)/IP and User Datagram Protocol (UDP)/IP.

5.2 A minimum of two registered Jacks (RJ)-45, IEEE 802.3 standard 10 Base-T Ethernet port for 3G cellular modems and 100 Base-TX Ethernet ports for 4G modems.

5.3 For each RJ-45 port, include a pre-terminated 6-foot Category 6 network cable that is Electronic Industries Alliance (EIA)/Telecommunications Industry Association (TIA)-568-A compliant.

6. ANTENNA

6.1 Omnidirectional external antenna rated for outdoor use and fully compatible with the modem in accordance with manufacturer specifications.

6.2 Antenna shall be vandal resistant and low profile.

6.3 Antenna shall be able to be easily mounted to cabinet. All mounting hardware shall be included.

6.4 50-Ohm Sub Miniature version A (SMA) male connector.

6.5 Include a 9-foot coax antenna cable(s) with required pre-terminated adapters (SMA) per the manufacturer's recommendation.

6.6 Minimum Antenna gain of 2 decibels relative (dBi).

6.7 2 antenna elements with operating Frequencies of 698-896 and 1700-2700 MHz.

7. POWER SUPPLY

Include compatible power supply and connections as recommended by the modem manufacturer.

8. MOUNTING REQUIREMENTS

Include mounting hardware to securely mount the modem in the cabinet.

9. ENVIRONMENTAL

9.1 Operating temperature for the modem and all associated field components

shall be -22° F to 158° F.

9.2 Storage temperature for the modem and all associated field components shall be -22° F to 158° F.

9.3 The modem and all associated field components shall operate in relative humidity of 5 percent to 95 percent non-condensing.

10. MANAGEMENT, SECURITY AND DIAGNOSTICS

10.1 Support real-time 2-way communications for remote management and shall include management software by the modem manufacturer.

10.2 Light-emitting diode (LED) indicators for Ethernet, power, cellular link/activity and signal strength.

10.3 Support signals for Transmit Data (TXD), Receive Data (RXD), Request To Send (RTS), Clear To Send (CTS), Data Terminal Ready (DTR), Data Set Ready (DSR), Data Carrier Detect (DCD) and hardware and software flow control.

10.4 Compatibility with Hypertext Transfer Protocol (HTTP)/HTTP Secure (HTTPS), Dynamic Host Communications Protocol (DHCP), Simple Network Management Protocol (SNMP) v2 or v3, Simple Mail Transfer Protocol (SMTP), Secure Socket Layer (SSL), Secure Shell (SSH)-2.

10.5 Web-based Graphical User Interface (GUI).

10.6 Command Line Interface (CLI) access via TELNET connection.

10.7 SNMP Management Information Base (MIB)-II and SNMP Traps.

11. SHIPPING

Each cellular modem, antenna, power supply, and cables shall be packed so as to provide protection in shipping. Packing shall be labeled indicating contents and shall include the manufacturer and model numbers.