

**BOOK 3**  
**DETAIL SPECIFICATIONS, STANDARDS, AND DETAILS**

**LAKE STREET RECONSTRUCTION**

**W. LAKE STREET FROM N. DAMEN AVENUE TO N. ASHLAND AVENUE**

**CDOT PROJECT NO.: B-4-118**

**SPECIFICATION NO.: 215456**



**CITY OF CHICAGO**  
**RAHM EMMANUEL**  
**MAYOR**

Prepared by the  
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**All Signatures To Be Sworn To Before A Notary Public**



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## **II. DETAILED SPECIAL PROVISIONS**

### **LIST OF STANDARD PAY ITEMS AND SPECIAL PROVISIONS**

#### **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.

#### **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.	----	Local Roads Temporary Pay Items
No. XZ	----	To XZ	----	Design Temporary Pay Items

#### **Typical Example and Digit Breakdown of a Coded Pay Item**

<b>Code No.</b>	<b>Description</b>
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.	CODE NO.	ITEM DESCRIPTION	SP REQ'D	PAGE NO.
1	CDOT2010010	ROOT PRUNING	Y	DS-1
2	CDOT2010020	TREE PROTECTION	Y	DS-3
3	20101000	TEMPORARY FENCE	N	
4	20100110	TREE REMOVAL (6 TO 15 UNITS DIAMETER)	N	
5	*****	ARBORIST INSPECTION	Y	DS-6
6	20200100	EARTH EXCAVATION	N	
7	CDOT3110010	SAND CUSHION, VARIABLE DEPTH	Y	DS-8
8	20800150	TRENCH BACKFILL	N	
9	CDOT2110010	PULVERIZED TOPSOIL MIX	Y	DS-9
10	25200110	SODDING, SALT TOLERANT	N	
11	30300001	AGGREGATE SUBGRADE IMPROVEMENT	N	
12	CDOT3110020	STRUCTURAL SOIL	Y	DS-10
13	31101400	SUBBASE GRANULAR MATERIAL, TYPE B 6"	N	
14	CDOT3530100	TEMPORARY PAVEMENT	Y	DS-13
15	35300400	PORTLAND CEMENT CONCRETE BASE COURSE 9"	N	
16	35301200	HIGH-EARLY-STRENGTH PORTLAND CEMENT CONCRETE BASE COURSE 9"	N	
17	40600290	BITUMINOUS MATERIALS (TACK COAT)	N	
18	40600300	AGGREGATE (PRIME COAT)	N	
19	40600400	MIXTURE FOR CRACKS, JOINTS, AND FLANGEWAYS	N	
20	40600535	LEVELING BINDER (HAND METHOD), N70	N	
21	*****	COLD PATCH	Y	DS-14
22	40600982	HOT-MIX ASPHALT SURFACE REMOVAL - BUTT JOINT	N	
23	40600990	TEMPORARY RAMP	N	

ITEM NO.	CODE NO.	ITEM DESCRIPTION	SP REQ'D	PAGE NO.
24	40603085	HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N70	N	
25	40603340	HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N70	N	
26	42000555	PORTLAND CEMENT CONCRETE PAVEMENT 12 3/4"	N	
27	*****	PORTLAND CEMENT CONCRETE DRIVEWAY AND ALLEY PAVEMENT, 8 INCH	Y	DS-15
28	CDOT4230010	HIGH-EARLY-STRENGTH PORTLAND CEMENT CONCRETE DRIVEWAY PAVEMENT, 8-INCH	Y	DS-16
29	CDOT4240010	PORTLAND CEMENT CONCRETE SIDEWALK, 5 INCH	Y	DS-17
30	CDOT4240030	PORTLAND CEMENT CONCRETE ADA RAMP, 5-INCH	Y	DS-18
31	CDOT4240040	PORTLAND CEMENT CONCRETE ADA RAMP, 8-INCH	Y	DS-18
32	CDOT4240055	LINEAR DETECTABLE WARNING TILES (CAST IRON)	Y	DS-19
33	CDOT4240070	PROPERTY LINE CURB	Y	DS-20
34	CDOT4400010	HOT-MIX ASPHALT SURFACE REMOVAL (VARIABLE DEPTH)	Y	DS-21
35	CDOT4400020	ALLEY PAVEMENT REMOVAL	Y	DS-22
36	*****	PAVEMENT REMOVAL (SPECIAL)	Y	DS-23
37	*****	RAILROAD TRACK REMOVAL	Y	DS-24
38	*****	DRIVEWAY PAVEMENT REMOVAL (SPECIAL)	Y	DS-25
39	*****	CURB REMOVAL (SPECIAL)	Y	DS-26
40	*****	COMBINATION CURB AND GUTTER REMOVAL (SPECIAL)	Y	DS-27
41	*****	SIDEWALK REMOVAL (SPECIAL)	Y	DS-28
42	*****	VAULTED SIDEWALK REMOVAL	Y	DS-29
43	*****	COMPACTED GRANULAR FILL IN VAULTED SIDEWALK	Y	DS-31
44	50100200	REMOVAL OF EXISTING STRUCTURES	Y	DS-32
45	50102400	CONCRETE REMOVAL	N	
46	*****	BUS SHELTER PAD	Y	DS-33

ITEM NO.	CODE NO.	ITEM DESCRIPTION	SP REQ'D	PAGE NO.
47	50800205	REINFORCEMENT BARS, EPOXY COATED	Y	DS-34
48	58100200	WATERPROOFING MEMBRANE SYSTEM	N	
49	CDOT5870010	PROTECTIVE CONCRETE SEALER	Y	DS-36
50	*****	DRILL AND GROUT DOWEL BARS	Y	DS-37
51	*****	CONCRETE STRUCTURES	Y	DS-38
52	*****	CONCRETE RETAINING WALL	Y	DS-39
53	*****	CAISSON CONCRETE	Y	DS-40
54	*****	TEMPORARY SHORING	Y	DS-50
55	*****	FURNISHING AND ERECTING STRUCTURAL STEEL	Y	DS-51
56	*****	CLEANING AND PAINTING EXISTING STRUCTURES	Y	DS-52
57	*****	STORM SEWERS, TYPE 1, 8-INCH (DUCTILE IRON PIPE)	Y	DS-53
58	*****	STORM SEWERS, TYPE 1, 8-INCH (EXTRA STRENGTH VITRIFIED CLAY PIPE)	Y	DS-53
59	*****	STORM SEWERS, TYPE 2, 6-INCH (EXTRA STRENGTH VITRIFIED CLAY PIPE)	Y	DS-53
60	*****	STORM SEWERS, TYPE 2, 8-INCH (EXTRA STRENGTH VITRIFIED CLAY PIPE)	Y	DS-53
61	*****	DOMESTIC WATER SHUT-OFF BOXES AND VALVE BOXES TO BE ADJUSTED	Y	DS-55
62	*****	DOMESTIC WATER SERVICE CAST IRON SHUT-OFF BOXES TO BE REPLACED	Y	DS-56
63	*****	CATCH BASINS TO BE ADJUSTED	Y	DS-57
64	*****	MANHOLES TO BE ADJUSTED	Y	DS-57
65	*****	CITY ELECTRIC MANHOLES TO BE ADJUSTED	Y	DS-57
66	*****	INLETS TO BE ADJUSTED	Y	DS-57
67	*****	VALVE VAULTS TO BE ADJUSTED	Y	DS-57
68	*****	WATER SERVICE METER VAULTS TO BE ADJUSTED	Y	DS-57
69	*****	ADDITIONAL MASONRY	Y	DS-58

ITEM NO.	CODE NO.	ITEM DESCRIPTION	SP REQ'D	PAGE NO.
70	CDOT6020010	CATCH BASINS, TYPE A, 4'-DIAMETER, TYPE 1 FRAME, OPEN LID (CITY OF CHICAGO)	Y	DS-59
71	CDOT6020020	INLETS, TYPE A, TYPE 1 FRAME, OPEN LID (CITY OF CHICAGO)	Y	DS-60
72	CDOT6020210	CATCH BASINS, TYPE A, 3'-DIAMETER, TYPE 1 FRAME, OPEN LID (CITY OF CHICAGO)	Y	DS-61
73	*****	FRAMES AND LIDS (CITY OF CHICAGO)	Y	DS-62
74	CDOT6050010	REMOVING MANHOLES	Y	DS-63
75	CDOT6050020	REMOVING CATCH BASINS	Y	DS-63
76	CDOT6050030	REMOVING INLETS	Y	DS-63
77	60500105	FILLING MANHOLES	N	
78	60500205	FILLING CATCH BASINS	N	
79	60500305	FILLING INLETS	N	
80	*****	HIGH-EARLY-STRENGTH COMBINATION CONCRETE CURB AND GUTTER, TYPE B-V.12	Y	DS-64
81	CDOT6060020	COMBINATION CONCRETE CURB AND GUTTER, TYPE B-V.12	Y	DS-65
82	60600605	CONCRETE CURB, TYPE B	N	
83	*****	TRAFFIC CONTROL AND PROTECTION	Y	DS-66
84	CDOT66400010	TEMPORARY CHAIN LINK FENCE WITH SCREENING, 6'	Y	DS-72
85	CDOT66400030	RELOCATE TEMPORARY CHAIN LINK FENCE WITH SCREENING	Y	DS-73
86	*****	CTA COORDINATION	Y	DS-74
87	*****	SECURITY AND WEATHER PROTECTION	Y	DS-80
88	66900200	NON-SPECIAL WASTE DISPOSAL	N	
80	66900205	SPECIAL WASTE DISPOSAL	N	
90	66900450	SPECIAL WASTE PLANS AND REPORTS	N	
91	66900530	SOIL DISPOSAL ANALYSIS	N	
92	CDOT6700010	ENGINEER'S FIELD OFFICE	Y	DS-81

ITEM NO.	CODE NO.	ITEM DESCRIPTION	SP REQ'D	PAGE NO.
93	67100100	MOBILIZATION	N	
94	70106800	CHANGEABLE MESSAGE SIGN	N	
95	70300100	SHORT TERM PAVEMENT MARKING	N	
96	70300220	TEMPORARY PAVEMENT MARKING - LINE 4"	N	
97	70300280	TEMPORARY PAVEMENT MARKING - LINE 24"	N	
98	70300520	PAVEMENT MARKING TAPE, TYPE III 4"	N	
99	70300560	PAVEMENT MARKING TAPE, TYPE III 12"	N	
100	70300570	PAVEMENT MARKING TAPE, TYPE III 24"	N	
101	70400100	TEMPORARY CONCRETE BARRIER	N	
102	70400200	RELOCATE TEMPORARY CONCRETE BARRIER	N	
103	*****	SIGN PANEL, TYPE 1, NON-RETROREFLECTIVE, SINGLE-SIDED	Y	DS-83
104	*****	SIGN PANEL, TYPE 1, RETROREFLECTIVE, TYPE A, SINGLE-SIDED	Y	DS-82
105	*****	SIGN PANEL, TYPE 1, RETROREFLECTIVE, TYPE A, DOUBLE-SIDED	Y	DS-83
106	*****	SIGN PANEL, TYPE 1, RETROREFLECTIVE, TYPE AZ, SINGLE-SIDED	Y	DS-83
107	72400710	RELOCATE SIGN PANEL - TYPE 1	N	
108	*****	FURNISH AND INSTALL POLE AND BASE	Y	DS-85
109	*****	REMOVE SIGN PANEL AND SALVAGE	Y	DS-88
110	*****	REMOVE SIGN PANEL AND POLE ASSEMBLY AND SALVAGE	Y	DS-88
111	78000200	THERMOPLASTIC PAVEMENT MARKING - LINE 4"	N	
112	78000400	THERMOPLASTIC PAVEMENT MARKING - LINE 6"	N	
113	78000600	THERMOPLASTIC PAVEMENT MARKING - LINE 12"	N	
114	78000650	THERMOPLASTIC PAVEMENT MARKING - LINE 24"	N	
115	78006100	PREFORMED THERMOPLASTIC PAVEMENT MARKING - LETTERS AND SYMBOLS	N	



ITEM NO.	CODE NO.	ITEM DESCRIPTION	SP REQ'D	PAGE NO.
116	78300100	PAVEMENT MARKING REMOVAL	N	
117	*****	DEBRIS REMOVAL	Y	DS-89
118	*****	TREE, GINKGO BILOBA (GINKGO), 2-1/2" CALIPER, BALLED AND BURLAPPED	Y	DS-90
119	*****	TREE, ULMUS PATRIOT (PATRIOT ELM), 2-1/2" CALIPER, BALLED AND BURLAPPED	Y	DS-90
120	*****	TREE, QUERCUS ROBUR FASTIGIATA (FASTIGIATE ENGLISH OAK), 2-1/2" CALIPER, BALLED AND BURLAPPED	Y	DS-90
121	*****	TREE, PRUNUS VIRGINIANA SCHUBERT (SCHUBERT CHOKEBERRY), 2" CALIPER, BALLED AND BURLAPPED	Y	DS-90
122	*****	TRENCH AND BACKFILL WITH SCREENINGS	Y	DS-95
123	*****	TRENCH AND BACKFILL FOR 2 TO 4 DUCTS	Y	DS-96
124	*****	ELECTRICAL HANDHOLE, 30"X36", WITH 24" FRAME AND LID	Y	DS-97
125	*****	ELECTRICAL HANDHOLE, HEAVY DUTY, 36"X36", WITH 24" FRAME AND LID	Y	DS-97
126	*****	ELECTRICAL MANHOLE 3'X4'X4', WITH 24" FRAME AND LID	Y	DS-99
127	*****	DRILL EXISTING ELECTRICAL MANHOLE OR HANDHOLE	Y	DS-101
128	*****	CLEAN EXISTING ELECTRICAL MANHOLE OR HANDHOLE	Y	DS-102
129	*****	REBUILD EXISTING MANHOLE ROOF	Y	DS-103
130	*****	ELECTRICAL FRAME AND LID, 30"	Y	DS-104
131	*****	CONDUIT IN TRENCH, 3" DIA., GALVANIZED STEEL	Y	DS-105
132	81100220	CONDUIT ATTACHED TO STRUCTURE, 3/4" DIA., PVC COATED GALVANIZED STEEL	Y	DS-105
133	*****	CONDUIT ATTACHED TO STRUCTURE, 1 1/2" DIA., PVC COATED GALVANIZED STEEL	Y	DS-105
134	*****	PVC CONDUIT IN TRENCH, 1" (SCHEDULE #40)	Y	DS-105
135	*****	PVC CONDUIT IN TRENCH, 2" (SCHEDULE #40)	Y	DS-105
136	*****	PVC CONDUIT IN TRENCH, 2 1/2" (SCHEDULE #40)	Y	DS-105
137	*****	PVC CONDUIT IN TRENCH, 3" (SCHEDULE #40)	Y	DS-105

ITEM NO.	CODE NO.	ITEM DESCRIPTION	SP REQ'D	PAGE NO.
138	*****	PVC CONDUIT IN TRENCH, 4" (SCHEDULE #40)	Y	DS-105
139	*****	PVC CONDUIT IN TRENCH, 2" (SCHEDULE #80)	Y	DS-105
140	*****	PVC CONDUIT IN TRENCH, 3" (SCHEDULE #80)	Y	DS-105
141	*****	PVC CONDUIT IN TRENCH, 4" (SCHEDULE #80)	Y	DS-105
142	*****	CONCRETE FOUNDATION FOR TYPE "P" BASE MOUNTED TRAFFIC SIGNAL CONTROLLER	Y	DS-108
143	*****	CONCRETE FOUNDATION FOR BASE MOUNTED STREET LIGHT CONTROLLER	Y	DS-109
144	*****	CONCRETE FOUNDATION, 20" DIAMETER, 3/4" ANCHOR RODS, 5 FEET	Y	DS-110
145	*****	CONCRETE FOUNDATION, 24" DIAMETER, 1 1/4" ANCHOR RODS, 15" BOLT CIRCLE, 7 FEET	Y	DS-111
146	*****	CONCRETE FOUNDATION, 30" DIAMETER, 1" ANCHOR RODS, 15" BOLT CIRCLE, 7 FEET	Y	DS-111
147	*****	HELIX FOUNDATION, 5' 10" B.C., 4 ANCHOR BOLTS	Y	DS-113
148	*****	ELBOW, CONDUIT, STEEL 2" ON POLE OR STRUCTURE	Y	DS-114
149	*****	ELBOW, CONDUIT, STEEL 2 1/2" ON POLE OR STRUCTURE	Y	DS-114
150	*****	POLE, STEEL, ANCHOR BASE, 10" DIA., 7-GAUGE, 34'-6"	Y	DS-115
151	*****	20' STEEL POLE, 10" B.C., 1" A.R.	Y	DS-115
152	*****	MAST ARM, STEEL, 4 FOOT WITH POLE PLATE	Y	DS-116
153	*****	MAST ARM, STEEL, 8 FOOT WITH POLE PLATE	Y	DS-116
154	*****	MAST ARM, STEEL, 12 FOOT WITH POLE PLATE	Y	DS-116
155	*****	PLATE, WELD TO POLE, 2-BOLT	Y	DS-117
156	*****	MAST ARM, STEEL, STREET LIGHTING, 1 FOOT	Y	DS-119
157	*****	LUMINAIRE, L.E.D. COBRAHEAD ARTERIAL, LED TYPE III (400 WATT HPS EQUIVALENT)	Y	DS-120
158	*****	LUMINAIRE, LED VIADUCT	Y	DS-122
159	*****	ALLEY LUMINAIRE, 54W LED	Y	DS-124

ITEM NO.	CODE NO.	ITEM DESCRIPTION	SP REQ'D	PAGE NO.
160	*****	RACK, SECONDARY AERIAL 3 WIRE	Y	DS-126
161	*****	CIRCUIT BREAKER, 1-POLE, 70 AMP, 600 VOLT, IN EXISTING STREET LIGHTING CONTROLLER	Y	DS-127
162	*****	SERVICE INSTALLATION, 200 AMP	Y	DS-128
163	X0324900	SERVICE CONNECTION TO CECO LINE	Y	DS-130
164	*****	ELECTRIC CABLE IN CONDUIT, TRIPLEX NO. 6, 2-1C AND NO. 8, 1-1C	Y	DS-131
165	*****	AERIAL CABLE, 3-1/C #6, WITH MESSENGER	Y	DS-133
166	*****	ELECTRIC CABLE IN CONDUIT, 1/C, #4	Y	DS-134
167	*****	ELECTRIC CABLE IN CONDUIT, 1/C, #10	Y	DS-134
168	*****	ELECTRIC CABLE IN CONDUIT, 1/C, #2/0	Y	DS-134
169	*****	JUNCTION BOX, POLE OR POST MOUNTED	Y	DS-135
170	81300320	JUNCTION BOX, STAINLESS STEEL, ATTACHED TO STRUCTURE, 8" X 8" X 6"	Y	DS-136
171	81300710	JUNCTION BOX, STAINLESS STEEL, ATTACHED TO STRUCTURE, 16" X 12" X 6"	Y	DS-136
172	*****	MAINTENANCE OF EXISTING TRAFFIC SIGNAL INSTALLATION	Y	DS-137
173	*****	TRAFFIC SIGNAL POST, ALUMINUM 15 FT	Y	DS-139
174	*****	TRAFFIC SIGNAL POST, ALUMINUM 17 FT	Y	DS-139
175	*****	SIGNAL HEAD, POLYCARBONATE, LED, 1-FACE, 3-SECTION, BRACKET MOUNTED	Y	DS-140
176	*****	PEDESTRIAN SIGNAL HEAD, POLYCARBONATE, LED, 1-FACE, BRACKET MOUNTED WITH COUNT DOWN TIMER	Y	DS-142
177	*****	CUT OFF POLE AND INSTALL CAP	Y	DS-144
178	*****	ELECTRIC CABLE IN CONDUIT, SIGNAL NO. 14 19C	Y	DS-145
179	*****	TEMPORARY TRAFFIC SIGNAL INSTALLATION	Y	DS-147
180	*****	REMOVE EXISTING TRAFFIC SIGNAL EQUIPMENT	Y	DS-150
181	*****	HARNESS CABLE, #16, 8/C	Y	DS-151

ITEM NO.	CODE NO.	ITEM DESCRIPTION	SP REQ'D	PAGE NO.
182	*****	ATC CONTROLLER, TRAFFIC, 16 LOAD BAY IN P CABINET, UPS	Y	DS-152
183	*****	CONTROLLER, STREET LIGHT, BASE-MOUNTED, 1-PHASE, 200 AMP	Y	DS-154
184	*****	LOOP POLE AND BASE, 10 FOOT	Y	DS-156
185	*****	LOOP POLE TWIN ARM ASSEMBLY	Y	DS-157
186	*****	LUMINAIRE, L.E.D. ORNAMENTAL ACORN	Y	DS-158
187	*****	BREAKDOWN EXISTING HANDHOLE	Y	DS-160
188	*****	REMOVE EXISTING CONCRETE FOUNDATION	Y	DS-161
189	*****	REMOVE EXISTING STREET LIGHTING EQUIPMENT	Y	DS-162
190	*****	MAINTAIN EXISTING LIGHTING SYSTEM	Y	DS-163
191	*****	COMMUNICATIONS CABLE RELOCATION	Y	DS-167
192	*****	PERENNIAL, HEMEROCALLIS 'HAPPY RETURNS' (HAPPY RETURNS DAYLILY), 1-GALLON	Y	DS-168
193	*****	PERENNIAL, HEMEROCALLIS 'LITTLE BUSINESS' (LITTLE BUSINESS DAYLILY), 1-GALLON	Y	DS-168
194	*****	PERENNIAL, HEMEROCALLIS 'ROSY RETURNS' (ROSY RETURNS DAYLILY), 1-GALLON	Y	DS-168

### **III. APPENDICES**

**Appendix A** – CDOT Division of Electrical Operations Material Specifications

**Appendix B** – CDOT Special Provisions

**Appendix C** – Chicago Department of Water Management Selected Specifications

**Appendix D** – Illinois Department of Transportation Special Provisions

- Index For Supplemental Specifications and Recurring Special Provisions
- Check Sheet for Recurring Special Provisions
- Check Sheet for Local Roads and Streets Recurring Special Provisions
- BDE Special Provisions Check List
- IDOT District 1 Special Provisions Check List

**Appendix E** – Chicago Transit Authority Selected Specifications

**Appendix F** – Chicago Department of Transportation Special Provisions

## NPDES Permit

### GENERAL INFORMATION

The following Detailed Specifications supplement the Illinois Department of Transportation "Standard Specifications for Road and Bridge Construction," adopted April 1, 2016 (hereafter referred to as the Standard Specifications or SSRBC); the "Supplemental Specifications and Recurring Special Provisions", adopted January 1, 2017; the latest edition of the "Illinois Manual of Uniform Traffic Control Devices for Streets and Highways" in effect on the date of invitation for bid; the "Manual of Test Procedures for Materials" in effect on the date of invitation for bid; the City of Chicago Department of Transportation Rules and Regulations for Construction in the Public Way (including Appendix B – ADA Standards) in effect on date of invitation for bids; and the City of Chicago Street Restoration Requirements in effect on date of invitation for bids. The latter two (2) documents are available on the City of Chicago Department of Transportation's web site. In case of conflict with any part or parts of said specifications, these Detailed Specifications will take precedence and will govern.

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

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

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

These Detail Specifications and the referenced standard specifications will govern the construction of the **Lake Street Reconstruction: Damen Avenue to Ashland Avenue**.

### LOCATION OF PROJECT

W. Lake Street from N. Damen Avenue to N. Ashland Avenue.

## TRAFFIC CONTROL PLAN

Traffic Control will be according to the applicable sections of the IDOT Standard Specifications for Road and Bridge Construction, the guidelines contained in the Illinois Manual on Uniform Traffic Control Devices for Streets and Highways, the Supplemental Specifications and the Recurring Special Provisions, the Specifications and any special details and highway standards contained herein and in the plans.

Special attention is called to Articles 107.09, 107.12, and 107.14 and Section 701 of the Standard Specifications and the following traffic control related (1) Highway Standards; (2) Details; (3) Supplemental Specifications and Recurring Special Provisions; and (4) Other Specifications contained herein:

### 1. Standards:

701301-04	LANE CLOSURE, 2L, 2W, SHORT TIME OPERATIONS
701311-03	LANE CLOSURE, 2L, 2W, MOVING OPERATIONS – DAY ONLY
701501-06	URBAN LANE CLOSURE, 2L, 2W, UNDIVIDED
701502-07	URBAN LANE CLOSURE, 2L, 2W, WITH BIDIRECTIONAL LEFT TURN LANE
701601-09	URBAN LANE CLOSURE, 1W OR 2W, WITH NONTRAVERSABLE MEDIAN
701602-08	URBAN LANE CLOSURE, MULTILANE, 2W WITH BIDIRECTIONAL LEFT TURN LANE
701901-06	TRAFFIC CONTROL DEVICES
704001-08	TEMPORARY CONCRETE BARRIER

### 2. Details:

Maintenance of Traffic – Westbound Detour Route  
Maintenance of Traffic – Eastbound Detour Route  
Maintenance of Traffic – General Notes/ Construction staging/ Typical sections  
Maintenance of Traffic – Traffic Plan (Suggested) Stage 1 and Stage 2  
Maintenance of Traffic – Traffic Plan (Suggested) Stage 3  
Maintenance of Traffic – Traffic Plan (Suggested) Stage 3A  
Maintenance of Traffic – Traffic Plan (Suggested) Stage 3B  
Maintenance of Traffic – Traffic Plan (Suggested) Stage 4  
Maintenance of Traffic – Traffic Plan (Suggested) Stage 4A  
Maintenance of Traffic – Traffic Plan (Suggested) Stage 4B

### 3. Supplemental Specifications and Recurring Special Provisions:

LRS 3	WORK ZONE TRAFFIC CONTROL
LRS 4	FLAGGERS IN WORK ZONES

### 4. Specifications:

TRAFFIC CONTROL AND PROTECTION  
MAINTENANCE OF ABUTTING PROPERTIES  
CHANGEABLE MESSAGE SIGN  
SHORT TERM PAVEMENT MARKING  
TEMPORARY PAVEMENT MARKING – LINE 4"  
TEMPORARY PAVEMENT MARKING – LINE 24"  
PAVEMENT MARKING TAPE, TYPE III- 4"  
PAVEMENT MARKING TAPE, TYPE III-12"  
PAVEMENT MARKING TAPE, TYPE II-24"  
TEMPORARY CONCRETE BARRIER  
RELOCATE TEMPORARY CONCRETE BARRIER  
PAVEMENT MARKING REMOVAL

5. Traffic:

Lake Street: Maintain traffic as depicted on the Maintenance of Traffic Plans and Typical Sections.

6. Detours:

Detours shall be in place as shown on the Maintenance of Traffic Plans during the stages as indicated on the Plans. Advance Changeable Message Signs (CMS) and CMS signs must be in place two (2) weeks in advance of detour.

COOPERATION WITH UTILITIES AND OTHERS

The Contractor is responsible for verifying the nature and status of all utility relocation work prior to preparation of the Detailed Progress Schedule (Article 108.02 of the Standard Specifications). The Contractor shall take appropriate measures to ensure that construction operations do not interfere with utility facilities and relocation work. The Detailed Progress Schedule will reflect construction sequencing which coordinates with all utility relocation work. The Contractor will be required to adjust the order of its work from time to time, to coordinate with utility relocation work, and will prepare revised Progress Schedule(s) in compliance therewith as directed by the Commissioner.

The Commissioner shall be notified in writing by the Contractor at least 48 hours prior to the start of any operation requiring cooperation with others. All other agencies, unless otherwise noted, will be notified in writing by the Contractor ten (10) days prior to the start of any such operation.

Where the Contractor is constructing new facilities for a utility, the utility will be notified at least five (5) days prior to the start of this work. The following persons have been contacted in reference to utilities they own and operate within the right-of-way limits for this project. All known data from these agencies has been incorporated into the plans. It is, however, the Contractor's responsibility to confirm or establish the existence of all utility facilities and their exact locations, whether contained in the data submitted by these agencies or not, and to safely schedule all utility relocations.

**1. Chicago Department of Transportation – Division of Electrical Operations**

Henry Yau

P: (312) 744-2450

- 2. Chicago Department of Water Management – Water Section**  
Kinsman Pearson P: (312) 894-4468
- 3. Chicago Department of Water Management – Sewer Section**  
4. Chuck Mann P: (312) 744-7013
- 5. Chicago Department of Streets and Sanitation – Bureau of Forestry**  
Joseph McCarthy P: (312) 746-5254
- 6. Chicago Transit Authority**  
Christina Arthur P: (312) 681-4168
- 7. AT&T**  
Bobby Akhter P: (630) 719-1483
- 8. MCI**  
Jim Todd P: (708) 458-6410
- 9. Commonwealth Edison**  
Leslie Paschal P: (630) 437-4767
- 10. People's Gas**  
Pamela Whitfield P: (312) 240-4242
- 11. JC Decaux**  
Matthew Williams P: (312) 456-2977
- 12. Comcast**  
Michel Soreze P: (847) 309-7374



**ITEM 1      CDOT2010010 - ROOT PRUNING**

Effective:      July 1, 2009

**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(a) 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.

**Equipment:** The mechanical root pruning machine must be approved by BOF prior to the start of work.

**Method of Measurement:** ROOT PRUNING will be measured for payment in lineal feet. Any fertilizing and watering that is necessary per Article 201.06 of the SSRBC is considered incidental to the item and will not be paid for separately.

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

**ITEM 2      CDOT2010020 - TREE PROTECTION**

Effective: July 15, 2009

**Description:** Work under this item shall be performed according to Section 201 of the SSRBC except as herein modified. This item consists of 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.

**General Requirements:**

- A. All trees designated for protection as shown on the plans or as directed by the Commissioner shall be identified with surveyor's flagging tape placed around the trunks at eye level.
- B. The Contractor must provide temporary orange snow fencing at the drip line (outer edge of tree canopy) of all trees designated for protection, as shown on the plans or as directed by the Commissioner. The fencing must be securely fastened to fence posts spaced a maximum of five (5) feet on center. Posts are six (6) feet in length with two (2) feet set into the ground and four (4) feet above ground. The fencing shall be attached to the post with a minimum of four (4) nylon locking ties evenly spaced at each post. Tree protection fence must remain in place throughout the duration of construction and must only be removed by direction of the Commissioner. Materials or equipment may not be stored within the tree protection area.
  - 1. The drip line shall act as the boundary for the fencing and shall be established on plans as the outer edge of the tree canopy. Multiple trees may be enclosed by a single fence line provided the fence is located at drip line of all trees.
  - 2. Where trees are located within Tree Pits, the fencing shall be installed at a minimum distance of the inside dimension of the Tree Pit opening with one stake at each corner of the opening.
  - 3. Where trees are located within Parkways, the fencing shall be installed along the width of the parkway with a maximum offset of one (1) foot from the back of curb or edge of sidewalk. Minimum tree protection at parkway length shall be determined as follows:
    - a. Small trees (<10" D.B.H.) minimum five (5) feet from the centerline of the tree.
    - b. Medium trees (10"-15" D.B.H.) minimum of ten (10) feet from the centerline of the tree.
    - c. Large trees (>15" D.B.H.) minimum of fifteen (15) feet from the centerline of the tree.
- C. Before beginning work, the Contractor shall have all TREE PROTECTION measures in place and shall obtain approval of Commissioner.
- D. The Contractor must hand dig when in the drip line of protected trees.

**Tree Protection Deficiencies**

- A. The protection of trees is extremely important. Tree Protection deficiencies are determined by the Commissioner and may include but are not limited to:
  - 1. Tree Protection not in place at the start of construction.

2. Tree Protection fencing damaged or down.
  3. Unauthorized removal of Tree Protection fencing.
  4. Contractor vehicles or equipment or personal vehicles driving or parking under trees.
  5. Any encroachment in Tree Protection fencing.
  6. Placement of any material within the Tree Protection fencing or tree drip lines.
  7. Damage to any tree.
  8. Unauthorized removal of trees.
  9. Unauthorized changes in grade.
- C. The Contractor must dispatch sufficient resources within 2 hours of notification to make needed corrections of deficiencies. If the Contractor fails to restore the required tree protection within the time limits specified above, the Commissioner will impose a monetary deduction for each incident. This time period will begin with the time of notification to the Contractor and end with the Resident Commissioner's acceptance of the corrections.
- D. For this project, the monetary deduction will be \$2000 per occurrence.
- E. 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.
- F. In the event that a tree is damaged by the Contractor's operation or personnel, the Contractor shall be responsible for repair or remediation of the damage as determined by the Commissioner, and/or Department of Streets and Sanitation Bureau of Forestry. In the event that the damage to the tree is beyond repair and requires removal or the Contractor mistakenly removed the tree, the tree must be replaced at the Contractor's expense. At a minimum any tree greater than 4" shall be replaced with a new tree as identified by the Commissioner and/or Bureau of Forestry and shall have a minimum of 4" caliper B&B. Any damaged tree smaller than 4" caliper measured 6" above ground shall be replaced in kind, inch for inch.
- G. The quality of the replacement tree must be equivalent to the standards of CDOT and/or the Bureau of Forestry. The cost of this work will be the responsibility of the Contractor.
- H. Violations resulting in soil compaction or grade changes in the tree protection area will subject the Contractor to perform vertical mulching and/or radial aeration as directed by the Commissioner.

#### Root pruning

The Contractor must provide ROOT PRUNING, as specified, where the limits of the TREE PROTECTION area are less than the trees' canopy or where roots become exposed during excavation or trenching. See ROOT PRUNING specification.

#### Clean-up and Disposal

Upon completion of work, the Contractor is responsible for ensuring that all TREE PROTECTION areas within the scope of work and adjacent areas that may have been impacted are clean and free of trash or debris.

**Method of Measurement:** TREE PROTECTION will be measured for payment per tree. Any sapling or tree with 1 to 3 stems with at least one stem having a minimum diameter of six (6 inches) must be measured as one tree. TREE PROTECTION must include furnishing, installing and removing the temporary fencing.

**Basis of Payment:** This work will be paid for at the contract unit price per each for TREE PROTECTION, which price must be payment in full for all labor, tools, equipment, materials and incidentals necessary to complete the work as specified.

**ITEM 5                   \*\*\*\*\*                   ARBORIST INSPECTION**

Effective:       January 1, 2010

**Description:** Work under this item shall consist of an Arborist Inspection for installation of new trees; and the trimming and protection of existing trees to remain at locations indicated on the plans, or as directed by the Commissioner. Work under this item shall be performed according to ANSI A300 Standards, the Guide to the Chicago Landscape Ordinance, and the best management practices of the Tree Care Industry Association and the International Society of Arboriculture (ISA).

**Arborist Qualifications:** The Arborist shall be certified with the ISA and have a minimum of 5 years' experience in the area of tree preservation and protection during construction.

**Arborist General Requirements:** Prior to construction the Arborist shall inspect and document the size, species, and condition of all existing trees, and make recommendations for TREE PROTECTION.

The Arborist shall review proposed tree planting locations and ensure that they follow the standards of the Guide to the Chicago Landscape Ordinance with emphasis on conflicts such as overhanging signage and power lines.

The Arborist shall meet with the Resident Engineer, the General Contractor and any applicable sub-contractor to review TREE PROTECTION recommendations and any recommended modifications to the proposed tree planting locations.

During construction the Arborist shall submit written reports documenting the inspection of new and existing trees and TREE PROTECTION installations and report any problems or damages. The Arborist shall verify the proper installation of new trees and tree grates. A minimum of two visits is required during construction to insure the protection of trees.

The Arborist shall ensure that recommended procedures to minimize the loss of roots where construction is to occur within the root zone of existing plant material are followed and shall supervise tree root pruning.

The Arborist shall submit a pruning inventory report prior to the start of pruning work and oversee the recommended removal of branches from trees that are to remain, as required.

The Arborist shall ensure that recommended procedures for excavation and grading work near existing trees are implemented.

After construction the Arborist shall inspect and inventory the status of trees. The Arborist shall submit a written certification; that all trees indicated to remain have been protected during the course of construction in accordance with recommendations; that trees were promptly and properly treated if damage did occur, that identifies any damaged trees which are incapable of retaining full growth potential and are recommended to be replaced, and that all new trees and tree grates have been properly installed.

**Method of Measurement:** This work will be measured for payment on a lump sum basis.

LAKE STREET RECONSTRUCTION  
DAMEN AVENUE TO ASHLAND AVENUE  
CDOT PROJECT NO.: B-4-118

AUGUST 2017

**Basis of Payment:** This work will be paid for at the Contract Unit Price per Lump Sum for ARBORIST INSPECTION. TREE PROTECTION and ROOT PRUNING will be paid for separately.

**ITEM 7      CDOT3110010 - SAND CUSHION, VARIABLE DEPTH**

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

**Description:** Work under this item shall be performed according to Section 311 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

This work shall consist of placing sand cushion of variable depth beneath proposed sidewalks, driveways, or other appurtenances as directed by the Commissioner.

**Materials:** Materials shall be a fine aggregate meeting the requirements of Article 1003.04.

**General Requirements:** If unstable or unsuitable subbase conditions are encountered after excavation to proposed subbase elevations, the Commissioner may require removal and replacement of this unsuitable material with sand cushion.

**Construction Requirements:** The method for placement and compaction of the sand cushion shall be to the satisfaction of the Commissioner.

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

**Basis of Payment:** This work will be paid for at the contract unit price per cubic yard for SAND CUSHION, VARIABLE DEPTH.



**ITEM 9**      **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 12 CDOT3110020 - STRUCTURAL SOIL**

Effective: February 1, 2009

Revised: August 17, 2011

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

**Materials:** 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:

<u>Component</u>	<u>Composition</u>
Coarse Aggregate	80-84% of total wet weight
Soil	16-20% of total wet weight
Hydrogel	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  $\frac{3}{4}$ "-  $1\frac{1}{2}$ " angular crushed stone with no more than 10% passing the  $\frac{1}{2}$ " 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:

<u>Soil Components</u>	<u>% of total weight</u>
Gravel	0 - 5%
Sand	20 - 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:** The soil mix 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.

**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.

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.

Bring the STRUCTURAL SOIL 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 fourteen (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:** 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 STRUCTURAL SOIL.

**ITEM 14      CDOT3530100 - TEMPORARY PAVEMENT**

Effective: July 1, 2010

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

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

Articles 355.08 and 406.11 of the SSRBC shall not apply.

**Method of Measurement:** TEMPORARY PAVEMENT 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. Removal of TEMPORARY PAVEMENT, if required, shall be included with this work.

**ITEM 21               \*\*\*\*\*               COLD PATCH**

**Description:** Work under this item consists of patching using a cold patch mixture and is only intended for use during winter months when LEVELING BINDER (HAND METHOD), N50 is not available. Approval from the Commissioner is required prior to the use of this item. The placement of the material must follow the guidelines in the LEVELING BINDER (HAND METHOD), N50 specification.

**Materials:** The materials used must meet the requirements of IDOT Specification Number M120-07.

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

**Method of Measurement:** COLD PATCH will be measured for payment in tons or portion thereof as evidenced by a load ticket furnished by the Contractor to the Commissioner showing the net weight of the material on the truck when it arrives on site. Material not placed will be deducted from the measurement.

**Basis of Payment:** The work under this item will be paid for at the contract unit price per ton for COLD PATCH, which price will include all costs in full for materials, labor, equipment, and all incidental work necessary to clean the existing surface, install, remove, and dispose of the cold patch mixture.

**ITEM 27           \*\*\*\*\*           PORTLAND CEMENT CONCRETE DRIVEWAY AND ALLEY  
PAVEMENT, 8 INCH**

**Description:** Work under these items shall be in accordance with the requirements of Section 423 of the Standard Specifications and the Standard Construction Details except as herein modified. This item consists of constructing Portland Cement Concrete driveway and alley pavement 8-inches thick on prepared sub base.

**Materials:** Concrete shall conform to the requirements of Section 1020.

**General Requirements:** Place High-Early Strength Portland Cement Concrete only at the direction of the Engineer.

**Method of Measurement:** PORTLAND CEMENT CONCRETE DRIVEWAY AND ALLEY PAVEMENT, 8 INCH 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 PORTLAND CEMENT CONCRETE DRIVEWAY AND ALLEY PAVEMENT, 8 INCH.

**ITEM 28      CDOT4230010 - HIGH-EARLY-STRENGTH PORTLAND CEMENT CONCRETE**  
**DRIVEWAY PAVEMENT, 8-INCH**

Effective:      July 1, 2009

Revised:      July 1, 2010

**Description:** Work under this item shall be performed according to Section 423 of the IDOT SSRBC, except as herein modified.

**Materials:** The Cement Factor shall be a minimum of 7.35 cwt. The mix shall be designed according to Section 3.0 of IDOT QC/QA PCC Level III Technician Manual. High-early-strength concrete shall achieve a minimum of compressive strength of 3,500 psi within three (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 DRIVEWAY PAVEMENT, 8-INCH.



**ITEM 29      CDOT4240010 - PORTLAND CEMENT CONCRETE SIDEWALK, 5-INCH**

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

**Description:** Work under this item shall be performed according to Section 424 of the SSRBC, 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. Saw cuts around staircases shall be considered incidental to the pay item.

**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 30      CDOT4240030 - PORTLAND CEMENT CONCRETE ADA RAMP, 5-INCH**  
**ITEM 31      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 SSRBC, except as herein modified.

**Construction Requirements:** This work shall be constructed according to the 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 32      CDOT4240055 - LINEAR 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 according to the latest Chicago Department of Transportation ADA Standards. Work shall be performed according to Section 424 of the SSRBC, except as herein modified.

**Materials:** 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).

**ITEM 33      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 construction ADA ramps as shown in the plans and as directed by the Commissioner.

**Construction Requirements:** This work shall be constructed according to the 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 34      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 35      CDOT4400020 - ALLEY PAVEMENT REMOVAL**

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

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

This work shall consist of the removal and disposal of existing alley pavement, regardless of depth and material types encountered, as shown on the plans and as directed by the Commissioner.

**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 ALLEY PAVEMENT REMOVAL.

**ITEM 36       \*\*\*\*\*       PAVEMENT REMOVAL (SPECIAL)**

**Description:** Work under this item shall be performed according to Section 440 of the SSRBC, except as herein modified. This work shall consist of removing all existing pavement sections, regardless of material types encountered, from the top of the existing pavement section to the proposed subgrade elevation.

PAVEMENT REMOVAL (SPECIAL) will not also be paid for areas identified as RAILROAD TRACK REMOVAL.

**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 PAVEMENT REMOVAL (SPECIAL).

**ITEM 37           \*\*\*\*\*           RAILROAD TRACK REMOVAL**

**DESCRIPTION**

This item consists of the removal and disposal of existing track structures and overlying pavements at the locations shown on the plans or as directed by the Commissioner from the top of existing pavement to the proposed subgrade elevation or bottom of track structure whichever is greater.

**GENERAL**

The Contractor must remove and dispose of all materials that constitute the existing track construction, including but not limited to: rails, tie plates, spikes, timbers, ties, HMA, and PCC pavements, and granite blocks. The Contractor must cut the existing rails at the limits of the removal with a saw or torch. The Contractor must also remove and/or compact the underlying ballast to provide a suitable subgrade for the replacement pavement.

Track structures must be disposed of in accordance to Article 202.03. Stockpiling of excavated material will not be allowed.

**METHOD OF MEASUREMENT**

**RAILROAD TRACK REMOVAL** will be measured for payment per square yard.

**BASIS OF PAYMENT**

This work will be paid for at the contract unit price per square yard for **RAILROAD TRACK REMOVAL**, which will be payment in full for all labor, equipment and supplies required to remove and dispose of track structures consisting of, but not limited to, rails, ties, granite block, supporting concrete, HMA overlay, and fill concrete from the top of the existing pavement to the proposed subgrade elevation or bottom of track structure whichever is greater.



**ITEM 38       \*\*\*\*\*       DRIVEWAY PAVEMENT REMOVAL (SPECIAL)**

**Description:** Work under this item shall be performed according to Section 440 of the SSRBC, except as herein modified. Work under this item shall consist of the removal and disposal of existing driveway and/or alley pavement section, regardless of material types encountered, from the existing elevation to the proposed subgrade elevation.

**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 DRIVEWAY PAVEMENT REMOVAL (SPECIAL).

**ITEM 39       \*\*\*\*\*       CURB REMOVAL (SPECIAL)**

**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.

Work under this item shall consist of the removal and disposal of the existing curb section, regardless of material types encountered, from the top of the existing curb section to the proposed subgrade elevation.

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

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

**ITEM 40       \*\*\*\*\*       COMBINATION CURB AND GUTTER REMOVAL (SPECIAL)**

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

Work under this item shall consist of the removal and disposal of the existing combination concrete curb and gutter section, regardless of material types encountered, from the top of the existing curb and gutter section to the proposed subgrade elevation.

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

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

**ITEM 41        \*\*\*\*\*        SIDEWALK REMOVAL (SPECIAL)**

**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, regardless of material types 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 foot for SIDEWALK REMOVAL (SPECIAL).

**ITEM 42           \*\*\*\*\*           VAULTED SIDEWALK REMOVAL**

**Description:** Work under this item shall be performed in accordance with Section 501 of the SSRBC, except as herein modified. This work consists of the removal and satisfactory disposal of existing vaulted sidewalks at locations shown and as directed by the Commissioner in accordance with details in the plans.

**General Requirements:** The Contractor must enter the vaulted area before removal operations and determine which utilities, if any, are located in this area. The Contractor must contact the property owner and utility and inform them of the utilities that require relocation. The Contractor, in its removal operations, must take care not to damage the utilities. It must be the Contractor's responsibility to protect all existing utilities from damage by whatever means is required.

The Contractor must saw cut a perpendicular clean joint between that portion of the sidewalk to be removed and that portion which is to remain in place. If the Contractor removes or damages the existing sidewalk outside the limits designated by the Commissioner for removal and replacement, he will be required to repair that portion at its own expense and to the satisfaction of the Commissioner.

The existing sidewalk, and/or roof, any deteriorated beams and any debris in the sidewalk vault must be removed and legally disposed of off the project site. Stockpiling of removed material will not be allowed.

If upon removal of the existing sidewalk the Contractor encounters or exposes any storage tanks, barrels or unexpected regulated substances, work in that area must be immediately discontinued and the Commissioner will be notified. The conditions must be treated with extraordinary caution and appropriate action must be taken to ensure public and employee safety. The Contractor's operation must not resume until so directed, in writing, by the Commissioner. Work in this area must be in accordance to Article 107.19.

After removal of any debris, any floor drains must be plugged with mortar, and the vault floor broken up to avoid water entrapment.

The Commissioner will visually inspect the existing building wall and curb wall, and if necessary, the Contractor shall make repairs. This work is to be paid in accordance with Article 109.04 of the Standard Specifications. Special care shall be taken when working near existing building walls. The Contractor shall saw cut full depth, if required, a line 12 inches from the building facade prior to removal to protect the building facade from damage. Small tools shall remove the vaulted walk within 12 inches and under the facade. This work shall be included in this item.

Minor existing openings to the property basement such as window and door openings not previously closed must be sealed with brick and mortar. The Contractor using plywood partition walls of sufficient strength to protect the basement contents against theft must close other larger openings and weather affects. This work shall be included in this item. The Contractor must install and maintain access to abutting property by utilizing wooden pedestrian bridges with railings, plywood walkways or steel plates as directed by the Commissioner. Access to abutting properties must be uninterrupted until the walk is fully restored. The Contractor must also be

responsible to install and maintain signing and other items to ensure pedestrian detouring away from & through the work site. This work shall be included in this item.

All street signs/poles removed for the satisfactory removal of concrete must be reinstalled. This work shall be included in this item and no further compensation will be allowed.

**Method of Measurement:** This work will be measured for payment in square feet of surface area to be removed.

**Basis of Payment:** The work under this item will be paid for at the contract unit price per square foot for VAULTED SIDEWALK REMOVAL, which price will also include the removal of the sidewalk and/or roof, wall, deteriorated beams, full depth saw cutting, sealing floor drains, breaking up the vault floor, protection of existing utilities, plod portion walls and closing of minor openings. The cost for removal and disposal of debris not part of the vaulted walk will be measured and paid for as DEBRIS REMOVAL.

**ITEM 43       \*\*\*\*\*       COMPACTED GRANULAR FILL IN VAULTED SIDEWALK**

**Description:** Work under these items shall be in accordance with the requirements of Section 207 of the Standard Specifications except as herein modified.

This item will consist of furnishing all labor, material, tools and equipment required to provide and install granular fill in vaulted sidewalks. All appurtenant and collateral work, whether shown or not, will be included, to provide a complete installation to the satisfaction of the Commissioner.

**Materials:** CA6 material conforming to Article 1004.04 of the SSRBC.

**Construction Requirements:** The granular fill shall be compacted in accordance with Section 207 of the Standard Specifications.

**Method of Measurement:** COMPACTED GRANULAR FILL IN VAULTED SIDEWALK will be measured for in cubic yards compacted in place and the volume computed by the method of average end areas.

**Basis of Payment:** This item of work will be paid for at the contract unit price per cubic yard, measured as specified for COMPACTED GRANULAR FILL IN VAULTED SIDEWALK.

**ITEM 44      50100200 - REMOVAL OF EXISTING STRUCTURES**

**Description:** This work shall consist of the removal of existing structures or portions thereof. Work will be performed according to the specifications for SELECTIVE STRUCTURE DEMOLITION and TEMPORARY SHORING, found elsewhere in these specifications.

**Method of Measurement:** When paid for as a separate item, removal of existing structures, removal of existing superstructures, and removal of existing deck will be measured for payment in units of each at the location designated on the plans.

When paid for as a separate item, the removal of concrete or masonry for partial removal of structures will be measured for payment in place and the volume computed in cubic yards (cubic meters).

Excavation of earth necessary to perform the removal of existing structures will not be measured for payment.

Rock excavation will be measured for payment according to Article 502.12.

**Basis of Payment:** When the contract contains a separate item for the removal of a structure, the work will be paid for at the contract unit price per each for REMOVAL OF EXISTING STRUCTURES at the location designated on the plans.

When the contract contains a separate item for the partial removal of concrete or masonry structures the work will be paid for at the contract unit price per cubic yard (cubic meter) for CONCRETE REMOVAL or MASONRY REMOVAL.

Disposal of materials specified for salvage but deemed unfit for further use through no fault of the Contractor will be paid for according to Article 109.04.

When existing structures or portions of existing structures are encountered which cannot be removed by normal excavation procedures and are not shown on the plans or are not evident in the field and are required to be removed, the cost of such removal will be paid for according to Article 109.04.

Rock excavation will be paid for according to Article 502.13.



**ITEM 46                   \*\*\*\*\*                   BUS SHELTER PAD**

**Description:** Work under this item shall be in accordance with JCDecaux details, Section 424 of the SSRBC and herein, as shown on the Plans.

**Materials:** Materials shall be according to the following:

Item	Article/Section
(a) Portland Cement Concrete	1020
(b) Preformed Expansion Joint Fillers	1051
(c) Welded wire fabric	1006.10

**Material Acceptance:** The Contractor must provide a Manufacturer's written certification that the materials comply with these specifications.

**Method of Measurement:** BUS SHELTER PAD will be measured for payment per square foot.

**Basis of Payment:** This work will be paid for at the contract unit price per square foot for BUS SHELTER PAD which shall include all work, materials, equipment and fittings necessary to construct a pad for a bus shelter to be placed upon.

**ITEM 47      50800205 - REINFORCEMENT BARS, EPOXY COATED**

**Description:** This work shall consist of furnishing and placing reinforcement bars. Work will be performed according to the specification for CONCRETE REINFORCEMENT EPOXY COATED, found elsewhere in these specifications.

**Method of Measurement:** This work will be measured for payment as follows.

(a) Contract Quantities. The requirements for the use of Contract Quantities shall conform to Article 202.07(a).

(b) Measured Quantities. Reinforcement bars and epoxy coated reinforcement bars incorporated in structures will be measured in pounds (kilograms) as computed for the sizes and lengths of bars shown on the plans or authorized by the Engineer. In computing the quantity to be paid for, the quantity of the bars of the cross section shown on the plans, or authorized, will be used. These weights (masses) are given in the following table.

English Bar Size	Weight, lb/ft
No. 3	0.376
No. 4	0.668
No. 5	1.043
No. 6	1.502
No. 7	2.044
No. 8	2.670
No. 9	3.400
No. 10	4.303
No. 11	5.313
No. 14	7.650
No. 18	13.600

Metric Bar Size	Mass, kg/m
No. 10	0.560
No. 13	0.994
No. 16	1.552
No. 19	2.235
No. 22	3.042
No. 25	3.973
No. 29	5.060
No. 32	6.404
No. 36	7.907
No. 43	11.380
No. 57	20.240

The computed weight (mass) will not include the extra metal used when bars larger than those specified are substituted by the Contractor per Article 508.09 or with the permission of the Engineer, the extra metal necessary for splices when bars shorter than those specified are substituted with the permission of the Engineer, the weight (mass) of any devices used to support or fasten the steel in correct position, the weight (mass) of the epoxy coating, or the weight (mass) of specified splice bars.

Tie bars in pavement or between pavement and other new and/or existing Portland cement concrete appurtenances, including all labor and materials required for installation and testing, will not be paid for separately, but shall be considered as included in the unit bid price for the Portland cement concrete item involved. Dowel bars in load transmission devices for pavement when required, will not be measured for payment. Reinforcement bars required for concrete piles or other reinforced concrete work in structures, where the concrete is not measured for payment in cubic yards (cubic meters), will not be measured for payment, but shall be considered as part of the piles or other complete units that are to be paid for as such. If the weight (mass) of the reinforcement per unit of measurement is increased from that shown on the plans, by authority of the Engineer, the additional weight (mass) of the steel will be measured for payment.

**Basis of Payment:** Reinforcement bars in reinforced concrete structures where the concrete is paid for at a unit price per cubic yard (cubic meter), will be paid for at the contract unit price per pound (kilogram) for REINFORCEMENT BARS or REINFORCEMENT BARS, EPOXY COATED.

**ITEM 49 CDOT5870010 - PROTECTIVE CONCRETE SEALER**

Revised: July 1, 2010

**Description:** Work under this item shall be performed according to the applicable portions of Sections 420, 421, 483, 503 and 587 of SSRBC, except as herein modified.

This work shall consist of providing and applying the protecting concrete sealer as directed by the Commissioner.

**Materials:** The use of linseed oil shall not be permitted. Material shall be in accordance with Section 1026 of the SSRBC. The material shall not affect the appearance of the concrete.

**General Requirements:** Proposed material shall be submitted for approval by the Commissioner. No material application work shall be allowed without the approval of the Commissioner.

**Construction Requirements:** The material shall be applied according to the Manufacturer's specifications.

**Basis of Payment:** This work will be paid for at the contract unit price per square yard for PROTECTIVE CONCRETE SEALER.

**ITEM 50           \*\*\*\*\*           DRILL AND GROUT DOWEL BARS**

**Description:** The work shall consist of furnishing and installing #4 or #5 epoxy coated dowel bars or epoxy coated tie bars in existing Portland Cement Concrete (PCC) bases where new PCC Curbs and Gutters, new PCC Bases and pavement patches are poured against existing PCC Bases at locations shown on the Plans and as designated by the Commissioner.

**General Requirements:** Perform work in accordance to Sections 442, 420, and Division 1000 of the Standard Specifications, except as herein modified. Materials for #4 or #5 dowel bars 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 structural slabs, retaining walls, curbs and gutters and bases are poured.

**Method of Measurement:** DRILL AND GROUT DOWEL BARS will be measured on an each basis, for each dowel or tie bar.

**Basis of Payment:** This work will be paid for at the contract unit price per each for DRILL AND GROUT DOWEL BARS, which price shall include the cost of all labor, equipment, and materials, including Dowel Bars, Tie Bars and non-shrink grout and all other work or material required to complete the work as specified.

**ITEM 51       \*\*\*\*\*       CONCRETE STRUCTURES**

Work under this item will be performed according to the specification for CAST-IN-PLACE CONCRETE in Appendix B and as shown on the details in the plans.

**Method of Measurement:** CONCRETE STRUCTURES will be measured in place and the volume computed in cubic yards.

**Quality Assurance:** This work will be paid for at the contract unit price per cubic yard for CONCRETE STRUCTURES, which will include payment for all work described herein.

**ITEM 52                   \*\*\*\*\*                   CONCRETE RETAINING WALL**

This work shall be constructed as shown on the plans or as directed by the Commissioner and in accordance with the applicable portions of Sections 503, 508, and 520 of the Standard Specifications except as modified herein.

**Description:** This work shall consist constructing concrete retaining wall as shown on the plans.

**Materials:** Materials shall be according to the following:

Item	Article/Section
(a) Portland Cement Concrete	1020
(b) Reinforcement Bars	1006
(c) Preformed Expansion Joint Filler	1051
(d) Nonshrink Grout	1024
(e) Waterproofing	1060

**Construction Requirements:** This item shall be constructed as detailed in the plans.

Concrete exposed to public view shall have a "Normal" finish as per Article 503.16. No additional payment shall be made for a "Normal" finish.

Holes for rebar shall be drilled with suitable equipment for this purpose to the depth shown and to a diameter large enough to allow grouting around the rebar. The bars shall be secured in the drilled holes with non-shrink grout. The grout shall be allowed to cure before the concrete for the new concrete retaining wall is poured.

**Method of Measurement:** CONCRETE RETAINING WALL shall be measured in place per foot.

**Basis of Payment:** This item of work will be paid for at the contract unit price per foot for CONCRETE RETAINING WALL, which price shall include all deformed bars, concrete, reinforcement, joint filler, waterproofing, and all other labor, material and equipment required to complete the work as specified.

**ITEM 53           \*\*\*\*\*           CAISSON CONCRETE**

Work under this item will be performed in accordance with Chapter 8 of the current American Railway Engineering and Maintenance-of-Way Association Specifications (AREMA), except as modified herein.

**Description:** This work will consist of furnishing all necessary labor, tools, equipment, materials and incidentals to construct caissons as indicated on the Plans and as directed by the Commissioner. The extent of caissons is shown on drawings, including locations, diameters of shafts, diameters of bells, estimated bottom elevations, top elevations, and details of construction.

This work includes, but is not limited to, the caisson concrete, excavation, temporary and permanent casing as required and testing for methane gas. Exploratory excavation for locating utilities prior to caisson construction is also included.

**Materials:** The caisson concrete must be according to Section 1020 of the standard specifications with the following exceptions:

- A. Portland Cement: ASTM C 150, Type I or II as required.
- B. Fly Ash is not allowed.
- C. Aggregates: ASTM C 33, and as herein specified.
  - 1. Local aggregates not complying with ASTM C 33, but which have shown by test or actual service to produce concrete of adequate strength and durability, may be used when acceptable to Authority.
  - 2. Maximum Aggregate Size: Not larger than three-fourths inch.
- D. Water: Drinkable.
- E. Air-Entraining Admixture: ASTM C 260.
- F. Water-Reducing Admixture: ASTM C 494, Type A, containing no set-accelerating or set-retarding compounds, chlorides, fluorides, or nitrates.
- G. High-Range Water-Reducing Admixture: ASTM C 494, Type F or Type G.

**CONCRETE MIX DESIGN**

- A. General: Use independent testing facility for preparing and reporting proposed mix designs and placement methods. Testing facility must not be same as used for field quality control testing.
- B. Design mix to produce concrete for caissons with minimum 28-day compressive strength of 6000 psi.
- C. Proportion mixes by either laboratory trial batch or field experience methods using materials and placement methods to be employed on Project for each class of concrete required, complying with ACI 211.1.



- D. Submit written reports to Authority of proposed mix for concrete at least 15 days prior to start of work. Do not begin concrete production until mix design has been reviewed by Authority.
- E. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant at no additional cost to Authority and as accepted by Authority. Laboratory test data for revised mix design and strength results must be accepted by Authority before using in Work.
- F. Admixtures: Use air-entraining admixture in concrete, unless otherwise directed. Add air-entraining admixture at manufacturer's prescribed rate to ensure in concrete at point of placement having 4 percent to 7 percent air content.
- G. Use water-reducing admixtures in strict compliance with manufacturer's directions. Admixtures to increase cement dispersion, or provide increased workability for low-slump concrete, may be used at Contractor's option.
- H. Use amounts of admixtures as recommended by manufacturer for climatic conditions prevailing at time of placing concrete. Adjust quantities of admixtures as required to maintain quality control.
- I. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement of not less than 4 inches and not more than 6 inches.

#### CONCRETE MIXING

- A. Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as herein specified.
  - 1. Delete references for allowing additional water to be added to batch for material with insufficient slump. Addition of water to batch will not be permitted.
- B. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.
  - 1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; and when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

#### STEEL CASING

- A. Steel Pipe Casings: ASTM A 252, Grade 2 or ASTM A 36/A36M.
- B. Corrugated Steel Casings: ASTM A 444.

#### **Submittals/Material Acceptance:**

- A. General: Submit the following in accordance with Conditions of Contract:
- B. Written procedure for the installation of the caissons. Computations must be provided for the design of the temporary casing required to support the soil to facilitate drilling the hole for the caisson. The temporary casing must be designed for earth pressures from soil and surcharge from existing CTA foundations that are adjacent to the proposed caissons. The existing CTA structure foundations are 9 feet by 9 feet in plan. The maximum applied bearing pressure from the existing CTA structure foundations is 3800

pounds per square foot. The design calculations, and procedure must be submitted to the Director for review and approval. The computations must be prepared and sealed by a Licensed Structural Engineer in the State of Illinois.

- C. Concrete Materials Test Reports as proposed for use in concrete mixes.
  - 1. Preliminary Caisson Report of actual allowable bearing capacity at bottom of each shaft, after testing each excavation.
  - 2. Certified Caisson Report for each caisson, recording actual elevation at bottom and top, elevation of rock (if any), final centerline location at top, variation of shaft from plumb, results of tests performed, actual allowable bearing capacity of bottom, depth of socket (if applicable), levelness of bottom, seepage of water, still water level (if allowed to flood), elevation of bottom and top of any casing left in place, any unusual conditions, variation of bell dimensions (if applicable) from original design, dates of starting excavation, completion of excavation, inspection, testing, and placement of concrete (include any delays in concreting and location of construction joints in shafts).
  - 3. Concrete Design Mix Reports listing mixes required and their respective test results.
  - 4. Concrete Test Reports, recording pertinent information and certification of compliance with Project requirements.

**Quality Assurance:**

- A. Codes and Standards: Comply with provisions of American Concrete Institute ACI 336.1 "Standard Specification for the Construction of End Bearing Drilled Piers," and as herein specified.
- B. Where provisions of above standard conflict with building regulations in effect for this Project, building regulations will govern, but only to establish minimum requirements.
- C. Caisson Installer Qualifications: Not less than three successfully completed contracts with similar soil conditions, shaft sizes, depths, and volumes of Work contained in this Project.
- D. Survey Work: Engage a registered surveyor or licensed professional engineer to perform surveys, layouts, and measurements for caisson work. Conduct layout work for each caisson to lines and levels required before excavation, and actual measurements of each caisson's location, shaft diameter, bottom and top elevations, deviations from specified tolerances, and other data as required.
- E. Record and maintain information pertinent to each caisson and cooperate with other testing and inspection personnel to provide data for required reports.
- F. Concrete Testing Service: Employ testing laboratory to perform material evaluation tests and to design concrete mixes.
- G. Contractor must employ separate testing laboratory to perform field quality control tests.
- H. Materials and installed work may require testing and retesting at any time during progress of Work. Allow free access to material stockpiles and facilities. Tests not specifically indicated

to be done at Contractor's expense, including retesting of rejected materials and installed work, are Contractor's responsibility.

- I. Certificates of material properties, indicating, compliance with specified requirements, may be submitted in lieu of testing when acceptable to Authority. Certificates of compliance must be signed by materials producer and Contractor.

**Job Conditions:**

- A. Site Information: Data on indicated subsurface conditions is not intended as representations or warranties of continuity of such conditions. It is expressly understood that Authority will not be responsible for interpretations or conclusions drawn there from by Contractor. Data are made available for convenience of Contractor and are not guaranteed to represent conditions that may be encountered.
- B. Additional test borings and other exploratory operations may be made by Contractor at no additional cost to Owner.
- C. Existing Utilities: Locate existing underground utilities before starting caisson excavation operations. If utilities are to remain in place, provide protection from damage during caisson operations.
- D. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult Architect immediately for directions as to procedure. Cooperate with Authority and utility companies in keeping services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
- E. Do not interrupt existing utilities except when permitted in writing by Authority and after acceptable temporary utility services have been provided.

**Construction:** During excavation of the caissons, methane gas may be encountered in the caissons. Gas detection equipment must be utilized in every excavation. No down hole inspection or cleaning must be performed without first testing for methane gas.

Full height permanent casing is required. Permanent casing can consist of a corrugated steel casing, and should be employed to a depth of two to three feet below the temporary casing. Before removing the temporary casing, the annular space between the liner and casing must be filled with grout to lessen voids.

Prior to the construction of the caissons, the Contractor must "pot hole" the caisson location to locate existing utilities in the vicinity of the caissons and if necessary relocate them or take the proper precaution to avoid damaging the utilities.

**CAISSON EXCAVATION**

- A. General: Excavate holes for caissons to required bearing strata or elevations shown on drawings. Excavate holes for closely spaced caissons, and those occurring in fragile or sand strata, only after adjacent holes are filled with concrete and allowed to set.
- B. Caisson design dimensions shown are minimums. The design of caissons is based on assumed strata bearing capacity. If bearing stratum is not capable of maintaining bearing capacity assumed, foundation system will be revised as directed by Authority. Revisions will be paid for in accordance with Contract conditions relative to changes in Work.

- C. If required, install casings as excavation proceeds so that earth walls are maintained without spilling into shaft.
  - (1) When assumed elevation of top of bell portion is reached, casing may be stopped, with a smaller inner section carried down to bearing stratum. Do not extend inner section beyond actual top of bell to maintain designed caisson shaft diameter.
- D. Construction Tolerances: Locate centerline of caissons within the following tolerances:
  - (1) Maximum permissible variation of location not more than 1/24th of shaft diameter or 3 inches, whichever is less.
  - (2) Shafts out of plumb not more than 1.5 percent of length nor exceeding 12.5 percent of shaft diameter or 15 percent, whichever is less.
  - (3) Concrete cut-off elevation, plus 1 inch to minus 3 inches.
- E. If above tolerances are exceeded, provide corrective construction to compensate for excessive eccentricity. Submit proposed corrective construction methods to Authority for review before proceeding.
- F. Temporary Shaft Protections: When required, provide full-length watertight steel casings of sufficient thickness to withstand compressive, displacement, and withdrawal stresses and to maintain shaft walls. Temporary casings may be left in place or may be withdrawn as concrete is placed at Contractor's option.
- G. Shoring: Provide shoring in bells as required in unstable soil conditions to preclude cave-in during hand excavation and inspection operations.
- H. Obstructions: If rock, boulders, or other unforeseen obstructions are encountered which cannot be removed by standard caisson excavation methods, and if such obstructions are not indicated by available subsurface data, removal of such obstructions will be paid for in accordance with terms of Contract relative to changes in Work.
- I. Remove such obstructions by hand labor using air-powered tools or by other methods recognized in construction industry.
- J. Classification of Rock: Rock is defined as material which cannot be drilled with a conventional earth auger or underreaming tool, and requires use of special rock augers, core barrels, air tools, blasting, or other methods of hand excavation.
  - (1) Earth seams, rock fragments, and voids included in rock excavation area will be considered rock for full volume of shaft from initial contact with rock for pay purposes.
- K. The work of this Section includes demolition and removal of rock boulders, concrete, masonry, and other subsurface obstructions which are clearly indicated by Contract Documents, or by available subsurface exploration data, and is not considered a change in Work.
- L. Dewatering: Provide and maintain pumping equipment to keep excavations free of water before placing concrete. If excessive water is encountered and drilling operations must be halted, consult with Authority before using alternate methods of construction.

- M. Conduct water to general site run-off ditches and disposal areas with discharge lines. Provide ditching as required to conduct water to site drainage facilities.
- N. Bells: Excavate caissons to provide shape of belled-out portions, thickness of base of bells, and angle of slope for conical portion of bells as shown on drawings.
- O. Where soil conditions are encountered which make it impracticable to undercut bells to required dimensions, arch roof of bells or support with wood or steel shoring. Provide sufficient shores, resting on bearing strata, to support earth against caving or collapse. If there is tendency for roof to cave, leave shoring in place during concreting. Otherwise, remove shores and braces before placing concrete.
- P. Mechanically excavate bottom of bells to level plane and remove loose material before concrete is placed.
- Q. Inspection: Each caisson must be inspected and tested before placing concrete.
- R. Provide and maintain facilities with equipment required for inspection and testing of excavations. Cooperate with inspecting and testing personnel to expedite Work.
- S. Notify Authority and testing facility at least 6 hours prior to time excavations will be ready for inspection and tests.
- T. Depth of Bearing Stratum: If indicated depth of shaft excavation is reached without developing required stratum bearing capacity, immediately suspend excavation operations and inform Authority. Authority will determine procedures to be followed.
- U. Where changes in indicated depth or dimensions are required, or additional soil borings are required, proceed with such work when directed in writing by Authority.
- V. Over Excavation: No payment will be made for extra length, when caisson shafts are excavated to a greater depth than required or authorized by Authority, due to overdrilling by Contractor. Complete caisson and fill extra depth with concrete if other conditions are satisfactory. Overexcavated shafts will be measured and paid for to original design or authorized depth.
- W. Excavated Material: Remove excavated material and legally dispose off site.
- X. Excavation should not be left open; if caisson installation cannot be completed in one continuous operation, excavation must be backfilled.

#### PERMANENT STEEL CASINGS

- A. General: Provide permanent steel casings where shown on drawings of sufficient strength to withstand handling stresses and pressures from surrounding soil, surcharge loads from existing adjacent CTA foundations and water or concrete inside. Provide casings with inside clear diameter not less than diameter of caisson shaft.
- B. Steel Pipe Casings: Casings may be delivered in sections of any convenient length. Connect sections by continuous penetration welds during placement into caisson shaft excavation.

- C. Design bottom edge of lowest casing section to provide cutting shoe for penetrating into rock strata and affecting water seal.
- D. Corrugated Steel Casings: Provide corrugated steel casings formed of galvanized or bituminous-coated steel sheets.
- E. Corrugated casings may be delivered in sections or panels of any convenient length, and field connected in accordance with manufacturer's instructions.
- F. Installation: Install permanent steel casing as excavation work progresses to ensure stability of caisson shaft walls. Remove and replace, or repair, casings which have been damaged during installation and which could impair strength or efficiency of completed caisson.

#### REINFORCING STEEL AND DOWELS

- A. Before placing, clean reinforcing steel and dowels of loose rust, scale, dirt, grease, and other material which could reduce or destroy bond.
- B. Fabricate and erect reinforcing cages in shafts as one continuous unit using inner ring resteel. Place reinforcement accurately and symmetrically about axis of hole and hold securely in position during concrete placement.
- C. Use templates to set anchor bolts, leveling plates, and other accessories furnished under work of other sections. Provide blocking and holding devices to maintain required position during concrete placement.
- D. Protect exposed ends of extended reinforcing, dowels, or anchor bolts from mechanical damage and exposure to weather.

#### CONCRETE PLACEMENT

- A. General: Fill caissons with concrete immediately after inspection and approval by testing laboratory. Use protection sheets (cut out to receive concrete) over excavation openings, extending at least 12 inches beyond edge.
- B. Place concrete continuously and in a smooth flow without segregating. Provide mechanical vibration for consolidation of at least top 25 feet of each shaft.
- C. Place concrete by means of bottom discharge bucket, flexible drop chute, elephant trunk hopper, or tremie. Use chutes or tremies for placing concrete where a drop of more than 25 feet is required, or pump concrete into place.
- D. Place concrete in-the-dry unless placing under water is acceptable to Authority. If water occurs, and it is impracticable to dewater caisson excavation, and reasonable attempts to seal off water flow have failed, allow water level to attain its normal level and place concrete by tremie method. Control placement operations to ensure that tremie is not broken during continuous placing from bottom to top. Other methods of depositing concrete under water may be used, if acceptable to Authority.
- E. Maintain a sufficient head of concrete to prevent reduction in diameter of caisson shaft by earth pressure and to prevent extraneous material from mixing with fresh concrete. Coordinate withdrawal of temporary casings with concrete placement operations to maintain a head of concrete approximately 5 feet above casing bottom.

- F. Stop concrete placement at cut-off elevation shown, screed level, and apply a scoured, rough finish. Where cut-off elevation is above ground elevation, form top section above grade and extend shaft to required elevation.
- G. Interrupted placing operations of over twenty minute duration will require a cold joint installation. Leave resulting shaft surface approximately level and insert steel dowels as shown on drawings. At resumption of concrete placing, clean off surface laitance, roughen as required, and slush with a 1-to-1 cement grout or commercial bonding agent before remainder of concrete is placed.
- H. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures in compliance with ACI 306 and as herein specified.
- I. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C) uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C), and not more than 80 deg F (27 deg C) at point of placement.
- J. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
- K. Do not use calcium chloride, salt, or other mineral containing antifreeze agents or chemical accelerators, unless accepted by Authority.
- L. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
- M. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F (32 deg C). Mixing water may be chilled, or chopped ice may be used to control concrete temperature, provided water equivalent of ice is calculated into total amount of mixing water. Cooling concrete mixture by use of liquid nitrogen may be used if acceptable to Authority.
- N. Place concrete immediately upon delivery. Keep exposed concrete surfaces and formed shaft extensions moist by fog sprays, wet burlap, or other effective means.
- O. Do not use retarding admixtures without acceptance of Authority.

#### FIELD QUALITY CONTROL

- A. Quality Control Testing during Construction: Sample and test concrete for quality control during placement as follows:
  - 1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
  - 2. Slump: ASTM C 143; one test for each concrete load at point of discharge, and one for each set of compressive strength test specimens.
  - 3. Air Content: ASTM C 231, pressure method; one test for each set of compressive strength test specimens.

4. Compression Test Specimens: ASTM C 31; one set of four standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
  5. Concrete Temperature: Test when air temperature is 40 deg F (4 deg C) and below, and when 80 deg F (27 deg C) and above, and each time a set of compression test specimens made.
  6. Compressive Strength Tests: ASTM C 39; one set of four cylinders per drilled pier but not more than one set per truck. One specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
- (a) When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing in-place concrete.
- B. Report test results, in writing to Authority and Contractor on same day tests are made. Include in reports Project identification name and number, date of concrete placement, name of contractor, name of concrete supplier and truck number, name of concrete testing service, concrete type, location of caisson, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength and type of break for both 7-day test and 28-day test.
- C. Additional Concrete Tests: Testing service may take core samples of in-place concrete when test results indicate such that there is reasonable doubt that specified concrete strengths have not been attained.
1. Continuous coring of caissons may be required, at Contractor's expense, when time for removal of temporary casings exceeds specified limits, or where observations of placement operations indicate suspicion of quality of concrete, presence of voids, segregation, or other possible defects.
- D. Inspection and Tests for Caissons: Soil testing facility must perform and report specified tests and additional tests which may be required. Conduct tests and provide reports as soon as possible so as not to delay concreting operations for acceptable excavations.
- E. Bottom elevations, bearing capacities, and lengths of caissons as shown on drawings are estimated from available soil data. Actual elevations and caisson lengths, and bearing capacities will be determined by soil testing facility from conditions found in excavations. Final evaluations and acceptance of data will be determined by Authority.
- F. Conduct test as follows:
1. For hardpan bearing, make tests for first 3 caissons and one of every 6 caissons thereafter, unless otherwise directed by Authority.
  2. For rock bearing, make tests for first 3 caissons, and additional tests as directed by Authority.
- G. Caissons Bearing on Hardpan: Take undisturbed samples, suitable for tests required, from caisson bottom. Make auger probe to a depth of 8 feet below bottom and visually inspect and classify soil. Verify continuity and thickness of stratum.
- H. Conduct the following tests on each sample, and report results and evaluations to Authority.



1. Unconfined Compression Test (ASTM D 2166).
  2. Moisture Content (ASTM D 2216).
  3. Density.
- I. Caissons Bearing on Rock: Inspect and test each caisson bottom by drilling and probing to a depth of 8 feet below bottom elevation to determine whether voids, clay seams, or solution channels exist.
- J. Take undisturbed rock core samples from selected caisson bottoms. Conduct compression test for each sample and report results and evaluations to Authority.*

**Method of Measurement:** CAISSON CONCRETE will be measured in place and the volume computed in cubic yards.

**Basis of Payment:** This work will be paid for at the contract unit price per cubic yard for CAISSON CONCRETE, which will be payment for all work described herein.

Payment for caissons will be made on actual net volume of caissons in place and accepted. The actual length, shaft diameter, and bell diameter (if applicable) may vary to coincide with elevations where satisfactory bearing strata are encountered, and with actual bearing value of bearing strata determined by testing services, and with stability and characteristics of soil strata. Adjustments will be made on net variation of total quantities, based on design dimensions for shafts and bells.

There will be no additional compensation for excavation, concrete fill, casings, or other costs due to unauthorized over excavating of shafts or bells. No payment will be made for rejected caissons.

Prices quoted include full compensation for labor, materials, tools, equipment, and incidentals required for excavation, trimming, shoring, casings, dewatering, concrete, and other items for complete installation.

Steel Reinforcement will be paid for separately under REINFORCEMENT BARS, EPOXY COATED.

**ITEM 54               \*\*\*\*\*               TEMPORARY SHORING**

Work under this item will be performed in accordance with Chapter 7 and Chapter 15 of the current American Railway Engineering and Maintenance-of-Way Association Specifications (AREMA), except as modified herein.

**Description:** This work will consist of furnishing all labor, tools, equipment, materials, and incidentals required for furnishing, fabricating, transporting, erecting, and removing all structural steel, timber and hardware, and jacks for the Temporary Shoring at locations shown on the plans or as directed by the Commissioner and the CTA for the support of the existing structure that is to remain during the work. This work also includes continuous monitoring of the existing track structure during rehabilitation and jacking of the existing bents as required to make the connections of the existing cross girders to the new longitudinal girders. The Contractor must submit, at a minimum, the monitoring survey data on a weekly basis. Data must be a "running" tabulation of the readings.

**Submittals:** The Contractor must submit shop drawings of the temporary shoring and their foundations and locations to the Commissioner and the CTA for approval. The Contractor must provide for the Commissioner and CTA review of the method to be used for transferring the loads from the existing structure to the temporary shoring. Shoring to be designed for full train speed; no speed reductions will be allowed for this work. Jacks are not to support live load. This submittal must include all design calculations and details and must be sealed by a Licensed Structural Engineer in the State of Illinois.

**Construction Procedures:** The temporary shoring structures must provide total support for the members of the structure that are to remain and support the loads as outlined in the plans. The Contractor must maintain the temporary shoring throughout their use to the satisfaction of the Commissioner and the CTA.

The temporary shoring must be monitored and observed by the Contractor continuously for possible footing settlement and structural stability. The Contractor must perform all necessary work required such as raising, jacking, shimming or adjusting of one or several shoring elements to maintain the integrity of the existing structure. The elevations of the existing track structure must be monitored continuously during rehabilitation.

Prior to the installation of the shoring, the Contractor must locate existing utilities in the vicinity of the shoring and if necessary relocate them or take the proper precaution to avoid damaging the utilities.

After the dead and live load of the portion of the structure to remain in place has been transferred onto the temporary shoring the Contractor must protect the shoring as deemed necessary during removal and erection of the structure.

The Contractor must maintain the shoring in such a manner as to prevent damage to the supported element and as directed by the Commissioner and the CTA.

**Method of Measurement:** TEMPORARY SHORING will be measured for payment on a lump sum basis.

**Basis of Payment:** This work will be paid for at the contract unit price lump sum for TEMPORARY SHORING.

**ITEM 55                   \*\*\*\*\*                   FURNISHING AND ERECTING STRUCTURAL STEEL**

Work under this item will be performed according to the specification for STRUCTURAL STEEL, found elsewhere in these specifications and except as modified herein.

**Description:** It is the intent of this item to include all field drilling of bolt holes, removing and replacing rivets and field coping of existing steel as required for the erection of new structural steel. The Contractor will be responsible to field verify all existing structure dimensions prior to submittal of shop drawings.

**Qualifications:** The structural steel fabricator must be certified under the American Institute of Steel Construction Quality Certification Program, Category III- Major Steel Bridges Including Rolled Beam Bridges, in accordance with Article 3.1.1. Part 3, Chapter 15 of the AREMA Specifications. Evidence of certification must be submitted to the Commissioner for his approval before beginning work.

**Fracture Control Plan for Fracture Critical Members:** The Contractor is notified that certain elements of the structure are defined as Fracture Critical Material (FCM). FCM elements include the tension flanges of the Longitudinal Girder as specified on the contract Plans. The Contractor must adhere to all requirements of Section 15.1.14 of the AREMA Manual for fabrication, testing and necessary repairs to these members.

**Fabrication:**

- 1 The Contractor must give the Commissioner at least two weeks' notice of the beginning of work in the shop, in order that inspection may be provided. Work must not be done in the shop before the commissioner has been notified.
- 2 Bolt heads must face outward on longitudinal girder web connections. Bolt heads must face downward on the bottom gusset plates and bracing.

**Painting:** Painting must following the requirements noted on the contract plan and the Specification for PAINTING as specified herein.

**Erection:**

1. Bolt heads must face outward on exterior of the longitudinal girder web connections.

**Method of Measurement:** FURNISHING AND ERECTING STRUCTURAL STEEL will be measured for payment on a lump sum basis.

**Basis of Payment:** This work will be paid for at the contract unit price lump sum for FURNISHING AND ERECTING STRUCTURAL STEEL. Painting new structural steel members, as described elsewhere in these specifications, will not be paid for separately but will be included in the pay item FURNISHING AND ERECTING STRUCTURAL STEEL.

**ITEM 56       \*\*\*\*\*       CLEANING AND PAINTING EXISTING STRUCTURES**

**Description:** This work includes surface preparation, painting, and finishing of existing structural steel. Work will be performed according to the specifications for CLEANING AND PROTECTIVE COATINGS OF EXISTING SURFACES, found elsewhere in these specifications.

**Method of Measurement:** CLEANING AND PAINTING EXISTING STRUCTURES will be paid on a lump sum basis.

**Basis of Payment:** Painting existing steel will be paid for as included in the contract lump sum price for CLEANING AND PAINTING EXISTING STRUCTURES.

<b>ITEM 57</b>	<b>*****</b>	<b>STORM SEWERS, TYPE 1, 8-INCH (DUCTILE IRON PIPE)</b>
<b>ITEM 58</b>	<b>*****</b>	<b>STORM SEWERS, TYPE 1, 8-INCH (EXTRA STRENGTH VITRIFIED CLAY PIPE)</b>
<b>ITEM 59</b>	<b>*****</b>	<b>STORM SEWERS, TYPE 2, 6-INCH (EXTRA STRENGTH VITRIFIED CLAY PIPE)</b>
<b>ITEM 60</b>	<b>*****</b>	<b>STORM SEWERS, TYPE 2, 8-INCH (EXTRA STRENGTH VITRIFIED CLAY PIPE)</b>

**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 (CDWM) Regulations for Sewer Construction and Stormwater Management and CDWM Standard Specifications for Water and Sewer Main Construction, except as herein modified.

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

**Materials:** Materials shall be per the most current CDWM 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. storm 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 storm 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 pre-construction 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 the STORM SEWER of the MATERIAL, TYPE, and DIAMETER specified.

**ITEM 61           \*\*\*\*\*           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 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.

**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.

**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.

- 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

The Contractor must obtain copies of water service pipe plats 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.

**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 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.

**Basis of Payment:** This work will be paid for at the contract unit price per each for DOMESTIC WATER SERVICE CAST IRON SHUT-OFF BOXES TO BE REPLACED.



<b>ITEM 63</b>	<b>*****</b>	<b><u>CATCH BASINS TO BE ADJUSTED</u></b>
<b>ITEM 64</b>	<b>*****</b>	<b><u>MANHOLES TO BE ADJUSTED</u></b>
<b>ITEM 65</b>	<b>*****</b>	<b><u>CITY ELECTRIC MANHOLES TO BE ADJUSTED</u></b>
<b>ITEM 66</b>	<b>*****</b>	<b><u>INLETS TO BE ADJUSTED</u></b>
<b>ITEM 67</b>	<b>*****</b>	<b><u>VALVE VAULTS TO BE ADJUSTED</u></b>
<b>ITEM 68</b>	<b>*****</b>	<b><u>WATER SERVICE METER VAULTS TO BE ADJUSTED</u></b>

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

This work shall consist of the adjustment of existing catch basins, manholes, inlets, valve vaults, City electric manholes, water meter vaults or other structures. This work shall include the first two feet of masonry required to be added, removed or rebuilt to bring the specified casting to the finished grade of the proposed improvement.

**Materials:** 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.

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.

**Method of Measurement:** CATCH BASINS TO BE ADJUSTED, MANHOLES TO BE ADJUSTED, CITY ELECTRIC MANHOLES TO BE ADJUSTED, INLETS TO BE ADJUSTED, VALVE VAULTS TO BE ADJUSTED, and WATER SERVICE METER VAULTS TO BE ADJUSTED will be measured on an each basis which will include up to the first two (2') feet of required masonry work.

**Basis of Payment:** This work will be paid for at the contract unit price per each for CATCH BASINS TO BE ADJUSTED, MANHOLES TO BE ADJUSTED, CITY ELECTRIC MANHOLES TO BE ADJUSTED, INLETS TO BE ADJUSTED, VALVE VAULTS TO BE ADJUSTED, or WATER SERVICE METER VAULTS TO BE ADJUSTED..

**ITEM 69           \*\*\*\*\*           ADDITIONAL MASONRY**

Perform Work in accordance with Section 602 of the Standard Specifications except as herein modified.

**Description:** This item consists of additional masonry work required in excess of two (2) feet, which is required to rebuild to good condition or to adjust existing catch basins, manholes, inlets, vaults or hand holes to proposed grade.

**Materials:** Materials shall be according to the following:

<u>Item</u>	<u>Article/Section</u>
(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, valve 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 CATCH BASIN, MANHOLE, INLET, VALVE VAULT, or CITY ELECTRIC MANHOLES TO BE ADJUSTED. The cost of masonry additional to the first 2 feet will be measured in vertical linear feet.

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

**ITEM 70      CDOT6020010 - CATCH BASINS, TYPE A, 4'-DIAMETER, TYPE 1 FRAME,  
OPEN LID (CITY OF CHICAGO)**

Effective: July 15, 2009

Revised: July 1, 2010

**Description:** Work under this item shall be performed according to Sections 602 and 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.

**Materials:** Materials shall be according to the following:

- (a) Coarse aggregate for bedding material shall meet a CA 11 gradation in accordance with Article 1004.05 of the IDOT Standard Specifications.
- (b) Fine aggregate for backfilling material shall meet a FA 6 gradation in accordance with Article 1003.04 of the IDOT Standard Specifications.
- (c) City of Chicago standard frame and lid shall meet be in accordance with the City of Chicago Department of Water Management Standard Specifications for Water and Sewer Main Construction.

**General Requirements:** An ADA compliant open lid shall be placed on all catch basins located within the cross walk or as directed by the Commissioner.

**QC/QA Requirements:** All precast structures shall be from an IDOT approved source.

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

**ITEM 71      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.

**Basis of Payment:** This work will be paid at the contract unit per each for INLETS, TYPE A, TYPE 1 FRAME, OPEN LID (CITY OF CHICAGO).

**ITEM 72      CDOT6020210 - CATCH BASINS, TYPE A, 3'-DIAMETER, TYPE 1 FRAME,  
OPEN LID (CITY OF CHICAGO)**

Effective: July 15, 2009

Revised: July 1, 2010

**Description:** Work under this item shall be performed according to Sections 602 and 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.

**Materials:** Materials shall be according to the following:

- (d) Coarse aggregate for bedding material shall meet a CA 11 gradation in accordance with Article 1004.05 of the IDOT Standard Specifications.
- (e) Fine aggregate for backfilling material shall meet a FA 6 gradation in accordance with Article 1003.04 of the IDOT Standard Specifications.
- (f) City of Chicago standard frame and lid shall meet be in accordance with the City of Chicago Department of Water Management Standard Specifications for Water and Sewer Main Construction.

**General Requirements:** An ADA compliant open lid shall be placed on all catch basins located within the cross walk or as directed by the Commissioner.

**QC/QA Requirements:** All precast structures shall be from an IDOT approved source.

**Basis of Payment:** This work will be paid for at the contract unit price per each for CATCH BASINS, TYPE A, 3'-DIAMETER, TYPE 1 FRAME, OPEN LID (CITY OF CHICAGO).

**ITEM 73       \*\*\*\*\*       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 Commissioner.

At the direction of the Commissioner, 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.

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

<b>ITEM 74</b>	<b>CDOT6050010 - REMOVING MANHOLES</b>
<b>ITEM 75</b>	<b>CDOT6050020 - REMOVING CATCH BASINS</b>
<b>ITEM 76</b>	<b>CDOT6050030 - REMOVING INLETS</b>

Effective: May 15, 2009

Revised: June 6, 2012

**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:** All work associated with the salvage of the frames and lids shall be incidental to this item. Furnishing and installing new sewer pipe to maintain flow in pipe, will be paid for under the appropriate STORM SEWER item. All labor, materials, and equipment required to install Class SI concrete collars where specified on the plans, or where a proper connection cannot be made at the joint in an existing sewer will be incidental to this item.

**ITEM 80               \*\*\*\*\*               HIGH-EARLY-STRENGTH COMBINATION CONCRETE CURB  
AND GUTTER, TYPE B-V.12**

**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 Rules and Regulations for Construction in the Public Way.

**Materials:** 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 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 foot for HIGH-EARLY-STRENGTH COMBINATION CONCRETE CURB AND GUTTER, TYPE B-V.12



**ITEM 81      CDOT6060020 - COMBINATION CONCRETE CURB AND GUTTER, TYPE B-**  
**V.12**

Effective: December 1, 2008

**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 detail for P.C.C. Curb & Gutter included in the plan documents.

**ITEM 83                   \*\*\*\*\*                   TRAFFIC CONTROL AND PROTECTION**

**Description:** This item consists of the following items and includes a charge for failure to provide this Work.

- A.     **Traffic Control and Protection:** Work includes furnishing, installing, maintaining, relocating and removing signs, signals, markings, traffic cones, drums, barricades, temporary barriers, warning lights, flaggers and other devices for regulating, warning or guiding traffic during construction and special events for motorized traffic, non-motorized traffic, and pedestrians. Work also includes the establishment and maintenance of temporary detours detailed in the plans.
- B.     **Maintenance of Access to Abutting Property:** Work consists of providing, maintaining, removing and disposing of temporary access from the street being improved to abutting property. Use pedestrian bridges, temporary walkways, steel plates, crushed stone, or other items as directed by the Commissioner.

**A. TRAFFIC CONTROL AND PROTECTION**

**General Requirements:** Perform work in accordance with Section 701 and Articles 107.09 and 107.14 of the Standard Specifications and applicable sections of the Supplemental Specifications and Recurring Special Provisions, guidelines contained in the Illinois Manual on Uniform Traffic Control Devices for Streets and Highways, Interim Special Provisions and any Special Details and Highway Standards contained herein and in the plans. Placement and maintenance of all traffic control devices shall be as directed by the Commissioner. The Commissioner shall be the sole judge as to the acceptability of placement and maintenance of the traffic control devices prescribed in the appropriate standards.

Care shall be taken to adhere to provisions of the City of Chicago Municipal Code Section 13-32-125 Construction Site Cleanliness. Should contractor fail to comply, they may be cited for violation of the ordinance. Erection of a chain link fence and permeable mesh fabric as specified by the ordinance will be paid for under TEMPORARY CHAIN LINK FENCE. This fence will be relocated as necessary to protect the current work zone. Relocation of the temporary chain link fence to work areas shall be paid for under RELOCATE TEMPORARY CHAIN LINK FENCE.

This item of work shall include furnishing, installation, maintenance, relocation and subsequent removal of all signs, signals, markings, traffic cones, barricades warning lights, flaggers, variable message sign, and other devices which are to be used for the purpose of regulating, warning or guiding traffic and maintaining pedestrian access during the construction of this improvement.

A reduction of the traffic control shown in the contract will not be allowed

The Contractor must install changeable message signs two weeks prior to any major change in traffic patterns and/or detours. These signs will be paid for under CHANGEABLE MESSAGE SIGN.

Temporary information signing necessary for detours or maintaining access and community relations as indicated in the plans and herein will not be measured separately for payment but is considered incidental to the contract.

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 traffic

control devices which may be inconsistent with traffic patterns during the transfer from one construction stage to another.

At the completion of each stage of construction or whenever 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/her under this contract, and such devices shall 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.

Placement of short term, temporary and permanent pavement markings will be paid for separately under appropriate contract line items, unless otherwise noted as incidental on the plans.

The Commissioner will provide to the Contractor "NO PARKING AT ANY TIME - TOW ZONE" signs to be banded to all light poles or existing sign posts within the work zone, when construction is in progress.

Personal vehicles will not be permitted to park within the right of way except in specific areas designated by the Commissioner.

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 shall be made for flaggers. If no flaggers are available the Contractor must cease operations until they become available.

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 his/her detour barricade system without the prior approval of the Commissioner.

**TRAFFIC CONTROL DEFICIENCIES:** The following tasks are incidental to this item. **Failure to complete any of the following in a timely manner will result in the CHARGE FOR TRAFFIC CONTROL DEFICIENCIES being assessed daily until adequate traffic control is provided or the task is completed satisfactorily in the opinion of the Commissioner.**

1. Pavement Removal/ Replacement: Traffic control and protection required to safely route traffic around the removed pavement until the replacement pavement has cured and is ready to be opened to traffic. This traffic control and protection must include the use of arrow boards when required. The Commissioner will be the sole judge of the need for arrow boards.
2. Pavement Removal/ Replacement: Contractor must have base course paved and cured within 60 calendar days from start of pavement removal.
3. Paving Operations: At all times when paving operations are in progress to place surface, binder and/or leveling binder on roadways open to traffic, the contractor must provide a minimum of two certified flaggers. Flaggers must be assigned exclusively to flagging duties. Additional traffic control may also be required, including but not limited to arrow boards and cones.
4. Sidewalk at Corners: At intersections, sidewalk must be replaced on corners within 10 calendar days after removal, unless otherwise approved by Commissioner.

5. Driveway Access: The sole access to properties must never be closed completely. Access must be maintained at all times.

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

The work involved in maintaining the existing pavement as above specified will be paid for as extra work, in accordance with Article 109.04 of the Standard Specifications. Traffic control and protection required for this work shall be considered included in the lump sum price for TRAFFIC CONTROL AND PROTECTION.

**Project Signs:** The Contractor is required to furnish, erect, and maintain signs identifying the project subject to the requirements contained in Section XVI, Part I, Paragraph 6 of Book 1 (page 62). A total of two (2) signs will be required for this project.

**Arrow Boards:** A flashing arrow board meeting the requirements of Article 1106.02(H) of the Standard Specifications shall be operating at all times when a lane is closed to traffic on a multi-lane highway. Arrow boards shall be provided and located in ahead-on position within each lane closure taper. The cost of furnishing and maintaining arrow boards will be considered incidental to the Contract Lump Sum Price for TRAFFIC CONTROL AND PROTECTION.

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

**Pedestrian Access:** 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.

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.

Installation, maintenance and removal of necessary signs and barricades needed to direct pedestrians to usable sidewalks and walkways during the construction is incidental to this item. Contractor may provide temporary access with clean crushed stone as described in Maintenance of Access to Abutting Property in conjunction with wood ramps compliant with the ADA to provide walkways and access to abutting properties. TEMPORARY CHAIN LINK FENCE may be used to also delineate the pedestrian path in addition to being the perimeter of the construction work site, however, care must be taken to not obstruct the proposed path with fence footings.

NOTES:

- 1) Illinois Standard sign R11-1102 Sign legend "Sidewalk Closed (Arrow) Use Other Side": Size 24" x 30"; black legend on a white reflectorized background) must be placed at

- pedestrian crossing locations informing pedestrians of closed sidewalk sections where necessitated. Barricades shall be placed on all closed sidewalk sections.
- 2) Barricades shall be Type I or II.
  - 3) Pedestrian access paths will be maintained on both sides of the street where possible. Full closures of sidewalk must be approved by Commissioner. At minimum, where construction activities involve sidewalks on both sides of the street, the work shall be staged so that both sidewalks are not out of service at the same time.
  - 4) At each point of closure, sufficient numbers of barricades shall be used to completely close the pathway. Use one "Sidewalk Closed" sign at each end of a sidewalk section being reconstructed.
  - 5) Pedestrian walkways shall be maintained free of any obstructions and hazards such as holes, debris, mud, construction equipment, stored materials, etc.
  - 6) All hazards near or adjacent to walkways shall be clearly delineated.
  - 7) Care shall be taken to comply with the ADA Accessibility Guidelines while providing temporary pedestrian access, including: a) at minimum a 4' wide unobstructed path and a 5' wide x 5' long area at minimum every 200', b) maintain curb ramp access to open sidewalks and c) open excavations adjacent to pedestrian access paths must be protected by barricades or fence and delineated by a continuous bottom edge at least 6" high from walkway and a continuous rail or surface (fence) at 3' above the walkway.
  - 8) In accordance with the ADA guidelines, a 4' wide unobstructed sidewalk shall be maintained adjacent to the property line. Should this sidewalk be removed, replacement must be completed within 72 hours, unless otherwise directed by the Commissioner.

**Submittals:**

- A. Name of the individual in his/her direct employ who is to be responsible for the installation and maintenance of the traffic control and any temporary chain link fence for this project (see Article 701.04)
- B. The Contractor must notify CDOT – Permit Section at 744-0330, 121 N. La Salle St., Room 905, Chicago, IL and apply for the required permits at least fourteen (14) days before commencing construction or changing traffic flow unless otherwise approved by the Commissioner.
- C. Contractor must submit a traffic control plan at the beginning of the project identifying proposed pedestrian access path, access to adjacent business and residential entrances, and delineating proposed signage to clearly define pedestrian walkways during each construction phase. The Plan should identify placement of TEMPORARY CHAIN LINK FENCE.

Traffic control plans must be approved by the Commissioner prior to start of work.

**B. MAINTENANCE OF ACCESS TO ABUTTING PROPERTY**

**General Requirements:** 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 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.

Where possible, the Contractor must provide the temporary access by placing clean crushed stone fill having a CA-6 gradation meeting the requirements of Article 1004.04 of the Standard Specifications, from the street under improvement to abutting side streets, alleys, driveways, parking lots, buildings, houses, crosswalks, CTA bus stops disturbed by the construction, including access from sidewalks to the bus stops, and to any other property where egress and ingress is required. Also, to fill sewer trenches from the sub-base elevation to existing surface elevation.

The Contractor must provide and install steel plates to cover open trenches until pavement or sidewalk is placed.

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

The contractor shall provide at least 2 weatherproof (vinyl or similar material) banners displaying the message, "BUSINESSES OPEN" or similar. These banners will be securely affixed to the TEMPORARY CHAIN LINK FENCE WITH SCREENING, 6' as directed by the Commissioner to indicate and pedestrians that the local business establishments are open for business during construction. The banners may be perforated to allow wind to pass through. These banners will be relocated as necessary with the TEMPORARY CHAIN LINK FENCE WITH SCREENING, 6'.

Ground mounted signs may be substituted or a different message, banner type, or mounting type may be used with the Commissioner's approval.

Banner and legend size and color will be determined by the contractor and approved by the Commissioner, and should meet a minimum requirement of 6" letter height.

#### CTA Bus stop

The work consists of providing access to CTA bus stop. Contractor is responsible to for providing passengers access to CTA busses at all times. If temporary relocation is required, a notice shall be posted at the bus stop at least 72 hours prior to its relocation. Contractor is responsible to coordinate this activity with CTA.

The cost of temporary relocation, it's signing and other traffic control equipment necessary for relocation of CTA bus stops is included in contract lump sum price for TRAFFIC CONTROL AND PROTECTION and will NOT be paid for separately.

**Method of Measurement:** TRAFFIC CONTROL AND PROTECTION, which consists of the items of Traffic Control and Protection and Maintenance of Access to Abutting Property as described, will be measured for payment on a lump sum basis.

**Basis of Payment:** This work will be paid for at the Contract Lump Sum Price for TRAFFIC CONTROL AND PROTECTION, which price shall be payment in full for all labor, materials, equipment, transportation, handling and incidentals necessary to furnish, install, maintain, removing, and disposing of all traffic control devices, materials for temporary access, and materials for security and weather protection 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 shall be reflected in the bid price for this item.

**CHARGE FOR TRAFFIC CONTROL DEFICIENCY:** 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, in Traffic Control, Maintenance of Access to Abutting Property, Security and Weather protection, or pedestrian access/safety, (s)he will be the sole judge as to whether the deficiency is an immediate safety hazard. The Contractor must dispatch sufficient resources within 2 hours of notification to make

needed corrections of deficiencies that constitute an immediate safety hazard. Other deficiencies shall be corrected within 12 hours. If the Contractor fails to restore the required 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) 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 **\$1,000** per calendar day. For those deficiencies where corrective action was not an option, this monetary deduction will be immediate.

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. In addition any work performed by the Contractor within the work zone that presents a hazard to vehicular or pedestrian traffic shall 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.

**ITEM 84      CDOT66400010 - TEMPORARY CHAIN LINK FENCE WITH SCREENING, 6'**

Effective: October 1, 2008

Revised: July 1, 2009

**Description:** Work under this item shall consist of constructing, installing, maintaining and removing a chain link fence and gates with screening, of a height specified on the plans, or as directed by the Commissioner. Work under this item shall be performed according to Section 664 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

**General Requirements:** The chain link fence shall be anchored sufficient to resist wind loads of 30 pounds per square foot without deflection of more than three inches between top and bottom fence. The base shall not interfere with pedestrian and/or vehicular traffic, and shall be approved by the Commissioner.

Opaque Fabric Meshing shall be affixed to the chain link fence face. The fabric meshing shall allow passage of air but shall contain dust and dirt. The mesh fabric shall be the full height of the fence and cover the entire length of the fence including any gated opening. The fabric meshing and fence shall not contain any advertisement. The color of the fabric shall be approved by the Commissioner.

**Method of Measurement:** TEMPORARY CHAIN LINK FENCE WITH SCREENING, 6' will be measured for payment in feet, along the top of the fence from center to center of end posts, including the length occupied by gates.

**Basis of Payment:** This work will be paid at the contract unit price per foot for TEMPORARY CHAIN LINK FENCE WITH SCREENING, 6'.



**ITEM 85      CDOT66400030 – RELOCATE TEMPORARY CHAIN LINK FENCE WITH  
SCREENING**

Effective: July 1, 2009

**Description:** Work under this item shall consist of shifting or relocating a temporary chain link fence and gate with screening, as specified on the plans, or as directed by the Commissioner. Work under this item shall be performed according to Section 664 of the IDOT Standard Specifications for Road and Bridge Construction, except as herein modified.

**Method of Measurement:** RELOCATE TEMPORARY CHAIN LINK FENCE WITH SCREENING will be measured for payment in feet, along the top of the fence from center to center of end posts, including the length occupied by gates.

**Basis of Payment:** This work will be paid at the contract unit price per foot for RELOCATE TEMPORARY CHAIN LINK FENCE WITH SCREENING.

**ITEM 86           \*\*\*\*\*           CTA COORDINATION**

**Description:** This item is intended to reimburse the contractor for costs incurred for CTA flagging operations and inspections. The specification also lays out requirements for safety and coordination that the contractor must follow at all times.

All work to be done by the Contractor on, over or in close proximity of the CTA (Chicago Transit Authority) right-of-way must be performed in accordance with Article 107.12 of the Standard Specifications and the following additional CTA requirements:

1. The CTA's Representative for this project will be:

Mr. David Heard  
Manager  
Construction Oversight  
567 W. Lake Street  
P.O. Box 7598  
Chicago, IL 60680-7597  
(312) 681-3862

2. NOTIFICATION TO CTA:

- a. After the letting of the contract and prior to performing any work, the CTA Representative must be notified by the Department to attend the preconstruction meeting. In this meeting, the Contractor must confer with the CTA's Representative regarding the CTA's requirements for the protection of CTA utilities clearances, operations and safety, construction activities affecting the CTA R-O-W, CTA rail safety training, insurance requirements, security, CTA flagging services, and CTA cable relocation.
- b. Prior to the start of any work on or over the CTA's right-of-way, the Contractor must meet with the CTA Representative to determine his requirements for flagmen and other necessary items related to the work activities on, over and next to the CTA facilities and to receive CTA's approval for the Contractor's proposed operations.
- c. The Contractor must notify the CTA Representative 72-hours in advance of the time he intends to enter upon the CTA right-of-way for the performance of any work.
- d. It will be the Contractors sole responsibility to arrange for the required flagmen.
- e. The Contractor shall submit to the CTA requests for flagmen and other personnel at least forty-eight (48) hours (two normal working days and before noon) prior to the date and time the work will be performed and the personnel are required.

3. PROTECTION OF THE CTA TRAFFIC:

- a. The CTA will be operating trains mainline and rail yard operations 24 hours per day, seven days per week during the construction of this project.
- b. The Contractor must, at all times, take special care to conduct his operations over, under, adjacent to or adjoining the CTA facilities in such a manner as to prevent

settlement, damage or displacement to any CTA structures, equipment, tracks or portions thereof and to prevent interruption of train service.

- c. Any damage to the tracks or other CTA facilities caused by the Contractor's operations must be replaced or repaired by the CTA at the Contractor's expense.

4. REIMBURSEMENT OF COSTS:

- a. All Contractors performing work on or near CTA property will be required to provide a deposit, in advance, equal to \$50,000. No Contractor will be permitted to work prior to submission of a deposit. At the time of project completion the deposit will be returned to the Contractor within 30 days.
- b. The Department will not be liable for any delays by the CTA in providing flagmen or other services required by this Item.
- c. The cost of all flagmen, engineering inspection, switchmen, and other workmen furnished by the CTA and authorized by the Resident Engineer must be paid directly to the CTA by the Contractor.
- d. The amount paid to the Contractor must be the amount charged to the Contractor for all authorized CTA charges including CTA additive rates audited and accepted by the Department, in accordance with Article 107.12 and Article 109.05 of the Standard Specifications.
- e. Following the approval of the CTA invoices by the Department, the Contractor must pay all monies to the CTA invoiced and must submit to the Department certified and notarized evidence of the amount of payments. No overhead or profit will be allowed on these payments. These payments must be in addition to the deposit.
- f. All checks must be made payable to Chicago Transit Authority and be submitted, with appropriate documentation, to the CTA Treasury Department, 567 West Lake Street, PO Box 7567, 7<sup>th</sup> Floor, Chicago, IL 60680-7567.

- 5. Whenever any work, such as temporary shoring and erection procedures for spans over the CTA track, in the opinion of the CTA's inspector, may affect the safety of the trains and the continuity of the CTA's operations, the methods of performing such work must first be submitted to the CTA for approval. If operations by the Contractor during construction are determined by the CTA's inspector to be hazardous to the CTA's operations, the Contractor must suspend such work until reasonable remedial measures, and/or alternate methods, satisfactory of the CTA, are taken. Such remedial measures may include obtaining the services of the CTA personnel so that adequate protection may be provided.

6. CTA OPERATING RESTRICTIONS:

Operating requirements of the CTA, while work on the projects is in progress, are as follows:

- a. When the construction work is performed adjacent to an active track and the work does not involve the track or the third rail, the Contractor can provide (and the right-of-way allows for) an uninterrupted physical barrier (fence) at least 6 feet high (above track or platform level) to separate the work area from operating track(s).

With the barrier in place, work at track level may be permitted at any time without CTA flagman and Slow Zone protection.

Such temporary barriers must be installed as far from the operating track(s) as possible, but no closer than 7'-2" from the centerline of the nearest operating track. The materials, location, construction and installation of the temporary barrier and the work procedures in the vicinity of the barrier must be approved 48 hours in advance by the CTA Representative. Any construction work involving a crane lifting material higher than the barrier wall will still require CTA flagging protection.

b. Allowable Hours of Construction:

Monday through Thursday, inclusive – 8:00 p.m. (2000 hours) to 4:00 a.m. (0400 hours).

Friday 10:00 p.m. (2200 hours) to Monday 4:00 a.m. (0400 hours).

The Contractor will not be permitted to perform work along the right-of-way during City of Chicago events as follows:

1. Taste of Chicago
2. Chicago Air and Water Show
3. Chicago Venetian Night
4. Chicago Marathon
5. Chicago Jazz Festival
6. Chicago Blues Festival
7. Chicago St. Patrick's Day Parade
8. The Saturday before through the Sunday after Thanksgiving Day.
9. from December 21 through January 2
10. Easter Sunday
11. Gospel Fest
12. Lollapalooza

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

- c. Work that is adjacent to or over the CTA operating tracks without a barrier in place requires CTA flagmen.
- d. As much work as possible is to be done under normal CTA operating conditions (under traffic) without disruption of train movements.
- e. Interruptions will be provided solely at the CTA discretion, depending upon the transit service demands for special events and possible conflicts with prior commitments to other work schedule on the same route.
- f. No more than one service interruption will be allowed simultaneously on this CTA Line.
- g. Failure of the Contractor to return any of the tracks back to service after an authorization track outage scheduled for Contractor's work shall result in the following liquidated damages:

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

- h. Pedestrian traffic to the CTA facilities must be maintained at all times.
  - i. A notice of at least three (3) weeks must be given to the CTA prior to any beam removal or replacement, which will cause interruption to the CTA facilities and service.
  - j. Simultaneous work on two piers that will require flagmen and affect the train operation will not be allowed. Work, which will require flagmen, must be limited to only one side of the track at a time.
  - k. CTA must have access to all storage tracks and unrestricted train operation over special holidays such as “July 4” and events such as the “Taste of Chicago”. Dates for the above and other special holidays and events such as conventions, Auto shows, World Series, etc. will be given to the Department as soon as they are available.
  - l. The Contractor will be required to take all precautions to avoid debris concrete and other materials falling over the tracks.
7. OTHER SPECIAL CONDITIONS:
- a. The Contractor must caution all employees of the presence of electric third rail (600 volts DC), live cables and moving trains on CTA tracks. The Contractor must take all necessary precautions to prevent damage to life or property through contact with the electrical or operations systems. The Contractor must caution all employees that any contact with live electric third rail or “live” portions of train undercarriage may result in a severe burn or death.
  - b. The Contractor must establish third-rail safety precautions in accordance with Authority regulations, such as, using insulating hoods or covers for live third rail or cables adjacent to the work. The Authority will provide CTA-qualified personnel to the Contractor as Contact Personnel. Unless otherwise noted, only CTA personnel are allowed to disconnect power.
  - c. Safety Training: All employees of the Contractor or his Subcontractors who are required to work upon or adjacent to the CTA’s operating tracks will be required to attend and provide evidence of completion of a right-of-way safety training course administered by CTA.
  - d. Arrangements for the safety training course will be the Contractor’s responsibility. Contact the CTA Representative to arrange for the safety course.
  - e. The cost of the course is \$150.00 per person, payable to the CTA prior to taking the course. The cost of this course and the employee’s time for the course will be considered incidental to the cost of the contract. The course is one day long from 8:00 a.m. to 4:00 p.m.

- f. The Contractor, his Subcontractors and all of his employees who are required to work on or around the CTA's operating tracks must wear CTA type safety vest.
- 8. CTA TRANSIT CLEARANCE:

The Contractor must perform his work in a manner that provides adequate clearance to the CTA tracks. The clearances will not be less than the following for safe passage of trains:

2.18 m (7'-2") horizontal to the centerline of the nearest track in yard and right-of-way.

4.42 m (14'-6") vertical from the top of the high running rail.
- 9. PROTECTIVE SHIELD:
  - a. The Contractor must furnish, install, and later remove a protective shield to protect the CTA traffic from damage due to falling material and objects during construction. The protective shield may be a platform, a net or any other Department approved structure.
  - b. A minimum vertical clearance of 4.42 m (14'-6") above the high running rail of the CTA tracks must be provided at all times.
  - c. The protective shield and the supporting members must be designed to sustain a load of 200 pounds per square foot in addition to its own weight. Drawings and design calculations for the protective shield must be stamped by a Licensed Structural Engineer in the State of Illinois and must be submitted to the Department for approval. The protective shield may be constructed only after the Department has approved the drawings and the design.
- 10. The Contractor must be required to provide a schedule for material removal, delivery of new material, care operation over and around the tracks, and a schedule for access of workmen to the construction site.

**Method of Measurement:** CTA COORDINATION will be measured as an allowance.

**Basis of Payment:** CTA COORDINATION will be paid on an allowance basis. The amount paid to the contractor will equal the exact amount of evidenced payments which the contractor made to the CTA. Evidence of payments must be certified, notarized, and furnished to the Department; only payments meeting these requirements will be reimbursed. The contractor will not be due the balance any of the monies allocated for this item remaining after final audit or the value of the deposit.

The quantity of this item is estimated and may increase or decrease through the course of the contract depending on CTA, CDOT, and contract requirements. Any increases or decreases will not be considered a "significant change in the character of the work" as regards Article 104.02 of the Standard Specifications.

The estimated unit price and total cost have been included in the Schedule of Prices.

**ITEM 87               \*\*\*\*\*               SECURITY AND WEATHER PROTECTION**

**Description:** This work consists of providing security and weather protection for abutting property in accordance with Part 1 of the Contract Specifications.

**General Requirements:** The Contractor is responsible for coordinating the work with the building owners and their tenants, when the vault areas are uncovered and/or otherwise disturbed due to construction activities. The Contractor must define the limits of the proposed disturbance and the location of the improvements at each individual vault space in consultation with the building owners/occupants prior to the demolition of any vault areas.

**PLYWOOD ENCLOSURES:**

The Contractor must provide plywood enclosures as necessary for security and protection of abutting property.

**TEMPORARY HEAT:**

1. The Contractor will be responsible for temporary heating, as required during construction, to protect the work and adjacent properties from frost damage; also to ensure suitable working conditions for the construction operations of all trades. In areas where work is being conducted, the temperature must be maintained as specified in various Sections of the Specifications, but not less than 45 degrees F.
2. The Contractor must provide adequate ventilation to prevent the accumulation of excess moisture in the area of the work.
3. It is understood that when the permanent heating system is used for temporary heat for construction purposes, the Contractor must 1) obtain the approval of the Commissioner; 2) assume responsibility for the use of the existing system, and 3) pay all costs for restoring heating system to existing condition upon completion of the work.
4. Upon conclusion of the temporary heating period, the Contractor must remove all temporary piping and facilities, and recondition those parts of the permanent heating system used for temporary services.

**Maintenance:** Maintain security and weather protection uninterrupted, until sidewalk vaults are fully restored or filled.

**Special Security Requirements:** When a vault space is opened that has access to a building owner/occupant space, the Contractor is responsible for maintaining security for said property. In some cases, the building owner/occupants may have special security requirements. These special security requirements may include, but not be limited to security clearances and badges for the Contractor and Subcontractor, personnel working within areas that access the building; special requirements for security walls; security wall alarm systems; a bonded security guard registered in the State of Illinois at the property site wherever there is construction access to the building owner/occupant space (day or night), etc. These special security requirements will be included in this item and no additional payment will be made.

**Method of Measurement:** SECURITY AND WEATHER PROTECTION will be measured per each location where this item is required.

**Basis of Payment:** This item will be paid for per contract unit price for each location where SECURITY AND WEATHER PROTECTION is required, and the price will be payment in full to complete the work as specified herein.

**ITEM 92      CDOT6700010 - ENGINEER'S FIELD OFFICE**

Effective:      August 2, 2008

Revised:      July 8, 2009

**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 SSRBC, except as herein modified.

**General Requirements:** Field offices must comply with the requirements for ENGINEER'S FIELD OFFICE, except as herein modified.

Field office shall have a ceiling height of not less than seven (7) feet and a floor space of not less than 600 square feet.

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

Solid waste disposal consisting of four (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 (5) desk(s) minimum working surface 42"x30" each and five (5) non-folding office chairs with upholstered seats and backs and with wheels.
- b) One (1) four-drawer legal size file cabinets.
- c) Eight (8) folding chairs and one (1) 36"x96" folding tables.
- d) One office style frostless refrigerator with a minimum size of eight (8) cubic feet with a separate freezer unit.
- e) One microwave oven with a minimum capacity of one (1) cubic feet.
- f) Two (2) electric desk type tape printing calculators.
- g) Three (3) telephone(s) with multiline capability touch tone and voice mail (for exclusive use by the Commissioner). 1 phone line, 1 for voice, 1 for fax, and 1 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 (1) portable cellular phone with built in 2-way radio feature (Nextel Model I-560), for the exclusive use by the Commissioner.
- i) 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".
- j) The computer equipment shall fulfill the following minimum requirements, in conformance with the latest technology in use in the City of Chicago, or better. 3.2GhZ Pentium 4 Processor, 512MB Ram, 80GB Hard Drive, mouse and keyboard, CD+RW, DVD Combo drive, 17 inch Flat Panel Monitor, Standard Network Card (Connection to



City network). The computers shall have proper connection to the City of Chicago database.

- k) One case of approximately twelve (12) cans of aerosol marking paint, of the color chosen by the Commissioner.
- l) Accessible potable water and coffee service.

**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 SSRBC.

<b>ITEM 103</b>	<b>*****</b>	<b><u>SIGN PANEL, TYPE 1 NON-RETROREFLECTIVE, SINGLE-SIDED</u></b>
<b>ITEM 104</b>	<b>*****</b>	<b><u>SIGN PANEL, TYPE 1, RETROREFLECTIVE, TYPE A, SINGLE-SIDED</u></b>
<b>ITEM 105</b>	<b>*****</b>	<b><u>SIGN PANEL, TYPE 1, RETROREFLECTIVE, TYPE A, DOUBLE-SIDED</u></b>
<b>ITEM 106</b>	<b>*****</b>	<b><u>SIGN PANEL, TYPE 1, RETROREFLECTIVE TYPE AZ, SINGLE-SIDED</u></b>

**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 manufacturer'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 - RETROREFLECTIVE - TYPE A - SINGLE SIDED and SIGN PANEL – TYPE 1 – NON-RETROREFLECTIVE – TYPE A – SINGLE SIDED and SIGN PANEL - TYPE 1 - RETROREFLECTIVE - TYPE A - DOUBLE SIDED and SIGN PANEL – TYPE 1 – NON-RETROREFLECTIVE – TYPE A – DOUBLE SIDED and STREET NAME SIGNS for a fabricated, furnished and delivered sign.

**ITEM 108      \*\*\*\*\*      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 on 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 incidental to the cost of 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 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 ounces 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 M120 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 in 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 vendor 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 .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 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 (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 full size 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 or as directed by the Commissioner.

**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. 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.

**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.

**Warranty:** Warranty must be as referenced in Book 1. A manufacturer's warranty should be valid for 5 years. The warranty period will begin on the date of Final Punch List Completion and Acceptance of the work.

**Method of Measurement:** FURNISH AND INSTALL POLES AND BASE will be measured on the basis of each pole furnished and installed under the specified method.

**Basis of Payment:** FURNISH AND INSTALL POLE AND BASE will be paid for at the Contract Unit Price per each, which prices shall include the cost of poles, all sleeves, locking wedges, bases and all other required hardware to complete the installation of poles.

**ITEM 109       \*\*\*\*\*       REMOVE SIGN PANEL AND SALVAGE**

**ITEM 110       \*\*\*\*\*       REMOVE SIGN PANEL AND POLE 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 Resident Engineer on a regular basis. All removal work shall be performed in accordance with Section 724 of Standard Specifications

**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 such as FA-2 at no additional cost to the City..

In the case of removal of base mounted poles installed in existing sidewalk that won't be replaced, the extruding bolts will be sawed flush to the sidewalk surface immediately. The cost of sawing the bolts is incidental to the cost of REMOVE SIGN ASSEMBLY AND SALVAGE.

In the case of removal of poles embedded in sidewalk, the pole shall be sawed flush to the sidewalk surface and grouted with approved materials to close the open pipe. The cost of installing grout is incidental to the cost of the item REMOVE SIGN ASSEMBLY AND SALVAGE.

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

**Basis of Payment:** REMOVE EXISTING SIGN PANEL AND SALVAGE; REMOVE SIGN PANEL AND POLE ASSEMBLY SALVAGE; will be paid for at the bid unit price per each.

**ITEM 117      \*\*\*\*\*      DEBRIS REMOVAL**

Work under this item must be performed in accordance with Section 202 of the Standard Specifications, except as herein modified.

**Description:** This work consist of removal and legal disposal of any unsuitable debris in the area of a sidewalk vault to be abandoned or reconstructed as ordered by the Commissioner, in accordance with Article 202.03 of the Standard Specifications.

**General:** Debris removal under this item includes but not be limited to: loose masonry, rubble, cans, drums, and all other material necessary to construct the improvement to the lines and grades shown. Not included in this item are the sidewalk, deteriorated beams or other components of the actual vaulted sidewalk being abandoned or reconstructed.

Stockpiling of debris removed from the vaulted area will not be allowed.

Removal of unexpected regulated substances must be in accordance with Article 107.19. This work will not be included in this item.

**Method of Measurement:** The volume of debris removed will be measured by appropriate means prior to its removal and the volume computed on a cubic yard basis of DEBRIS REMOVAL.

**Basis of Payment:** This work will be paid for at the contract unit price per cubic yard for DEBRIS REMOVAL, which price will include all labor, material and equipment required to remove and legally dispose of all debris.



<b>ITEM 118</b>	<b>*****</b>	<b><u>TREE, GINKO BILOBA (GINKO), 2-1/2" CALIPER, BALLED AND BURLAPPED</u></b>
<b>ITEM 119</b>	<b>*****</b>	<b><u>TREE, ULMUS PATRIOT, (PATRIOT ELM), 2-1/2" CALIPER, BALLED AND BURLAPPED</u></b>
<b>ITEM 120</b>	<b>*****</b>	<b><u>TREE, QUERCUS ROBUR FASTIGIATA (FASTIGATE ENGLISH OAK), 2-1/2" CALIPER, BALLED AND BURLAPPED</u></b>
<b>ITEM 121</b>	<b>*****</b>	<b><u>TREE, PRUNUS VIRGINIANA SCHUBERT (SCHUBERT CHOKEBERRY), 2" CALIPER, BALLED AND BURLAPPED</u></b>

Effective: June 1, 2010  
Revised: February 11, 2016

**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.

**Materials:** Materials shall be according to the following Articles of Division 1000 - Materials of the Standard Specifications except as herein modified:

	Article/Section
(a) Materials for Planting.....	1081.01
(b) Topsoil.....	1081.05(a)
(c) Shredded Hardwood Mulch.....	1081.06(b)

**Trees:**

Nursery stock shall comply with American Standard for Nursery Stock ANZI Z60.1- 2004 (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:**

**New Construction**

Backfill for new construction sites shall consist of Pulverized Topsoil.

**Existing sites**

Backfill shall be a variable mixture, dependent upon the material. To avoid interfaces created by adjacent dissimilar soils with different textures, structures and organic matter, 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**

Pulverized topsoil shall comply with requirements set forth in Section 211 of the IDOT Standard Specifications for Road and Bridge Construction except as herein modified:

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

**Staking and guying materials: (per Commissioner request only)**

1. Stakes: 6' fence T-Post.

2. Guy Wire: Galvanized mild steel wire, minimum 12 gauge; provide double strands.
3. Hose: Rubber or plastic garden hose.
4. Turnbuckles: Aluminum or galvanized steel.
5. Warning flaps: Fluorescent orange plastic surveyor's tape.

Tree wrap tape

Nurseryman's standard protective tape.

**General Requirements:**

**Plant Delivery, Storage and Handling:**

1. 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.
2. Deliver freshly dug balled and burlapped stock unless otherwise approved.
3. Cover to protect stock during transport. Plant material transported without cover shall be automatically rejected.
4. Bind stock to protect branches, bark, and overall shape during transport.
5. Load and unload trees with care. Protect tree trunks prior to loading and unloading. Do not lift trees by wire basket or trunk.
6. Do not prune trees unless directed by the Commissioner.

Pulverize Topsoil Storage:

Pulverized topsoil 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 approved the testing results.

Preparation and Execution:

1. Installation cannot begin until the final grade has been achieved and soil has settled for a minimum of one week or as directed by Commissioner.
2. The Contractor shall be responsible for all plant layout. Qualified personnel must perform the layout as shown in the landscape plan. Otherwise, trees planted in the parkway shall be planted in the center of the parkway, and/or in line with existing trees in the parkway. The tree locations must be marked by staking. Trees planted in tree pits shall be planted in the center of the tree pit. The Commissioner will approve the layout prior to installation.

Planting Trees:

1. Tree planting method shall be approved by Commissioner or Authorized Representative prior to full scale installation.
2. 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 am - 3:00 p.m., Monday thru Friday, unless directed otherwise by the Commissioner.

**Submittals:**

1. Soil Laboratory Test

2. Soil sample - provide in 1 quart sealed plastic container.
3. Shredded hardwood bark mulch sample - provide in 1 quart sealed plastic container.
4. Request for Material Inspection Sheet.
5. Tree wrap - sample
6. Pre-emergent herbicide - Material Safety Data Sheet
7. Permits - CDOT Right of Way permit and BOF permit

**Construction Requirements:**

**Parkway Trees:**

**Excavation**

1. Excavation shall occur at the time of tree planting. The excavation for planting in a Parkway 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 or as directed by the Commissioner or Authorized Representative.
2. 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.
3. All soil shall be stockpiled for reuse or as otherwise directed (see Backfill).
4. Remove all excavated subsoil from the site and dispose of legally. Do not backfill excavation with subsoil.

**Planting:**

1. The existing nursery line on the tree shall expose the root flare above ground level upon completion of the planting operation. Trees planted with the nursery line below such level will not be accepted.
2. Untie all cords binding burlap to trunk. Remove all burlap and wire baskets from top 1/3 of the root ball.
3. Place backfill in 6" inch-thick layers. Work each layer by hand to compact backfill and eliminate voids. Maintain plumb during backfilling.
4. When backfilling is approximately 2/3 complete, saturate backfill with water and repeat until no more can be absorbed.
5. Place and compact remainder of backfill and water again.
6. Form watering basin around trunk with backfill holding at least 10 gallons.
7. Once soil has settled, add 3 inches of mulch in a 6' diameter saucer in Sodded Parkways. Mulch shall not be piled against the tree trunk.

**Staking and Guying (per Commissioner Directive Only):**

Guy and stake trees the same day as planting. Embed stakes 2 feet into grade. Tie with length of rubber or 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.

**Tree pit Trees:**

**Excavation**

1. 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.

2. Excavation of tree pits shall occur at the time of tree planting. Excavated tree pits shall not be left open. Excavation for tree pits 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 but with high center for drainage. Deglaze sides and loosen bottom.
3. The diameter of the hole shall be 1 foot wider than the root spread. The depth of the hole shall be such that the top of the root ball is slightly higher than soil level (see Drawings).
4. Remove all excavated subsoil from the site and dispose of legally. Do not backfill excavation with subsoil.
5. All soil shall be stockpiled for reuse or as otherwise directed (see Backfill).

#### Planting

1. Set plants on sub grade in excavation with graft and flare of root ball slightly higher than soil level in pit allowing space for volcanic rock and tree grate. (See Drawings and CAST IRON TREE GRATE, Materials under grate.)
2. For trees without grates, set plants on sub grade in excavation with graft and flare of rootball slightly higher than soil level in pit. Place three inch mulch layer around trees. Do not pile mulch against the trunk.
3. Untie all cords binding burlap to trunk. Remove all burlap and wire baskets from top 1/3 of the root ball.
4. Place backfill in 6" inch-thick layers. Work each layer by hand to compact backfill and eliminate voids. Maintain plumb during backfilling.
5. When backfilling is approximately 2/3 complete, saturate backfill with water and repeat until no more can be absorbed.
6. Place and compact remainder of backfill and water again with a minimum of 10 gallons of water.

#### Pruning (as directed by Commissioner)

Remove dead or broken branches. Make cuts with sharp instruments outside the branch collar. Do not remove leaders from trees. All pruning must be performed under the direct supervision of a certified arborist.

#### Protection of tree trunks

Inspect and, if necessary, treat trunks for physical damage or insect infestation. Wrap trunks of smooth barked trees in November and remove in April.

#### Mulch

Contractor shall make inspections of Mulched Parkways periodically (every six months during the guarantee period as specified) to ensure that level of mulch has been maintained.

#### Pre-emergent weed control

Pre-emergent weed control shall be applied to each tree pit or parkway mulch ring at the rate of once (1) per tree. This shall be applied prior to mulch application.

**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 or Authorized Representative. 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.)

1. Pyrus calleryana (Ornamental Pear)
2. Quercus (Oaks)
3. Robinia (Black Locust)
4. Syringa reticulata (Japanese Tree Lilac)
5. Ulmus 'Frontier' (Frontier elms)

**Inspections:**

The Commissioner will inspect plant materials 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 inspection on site 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.

**Period of Establishment:** Prior to being accepted, the plants shall endure a period of establishment in accordance with Article 253.14 of the Standard Specifications except that the period of establishment will be two (2) years.

**Method of Measurement:** TREE, GINKGO BILOBA (GINKGO), 2-1/2" CALIPER, BALLED AND BURLAPPED; TREE, ULMUS PATRIOT, (PATRIOT ELM), 2-1/2" CALIPER, BALLED AND BURLAPPED; TREE, QUERCUS ROBUR FASTIGIATA (FASTIGATE ENGLISH OAK), 2-1/2" CALIPER, BALLED AND BURLAPPED; and TREE, PRUNUS VIRGINIANA SCHUBERT (SCHUBERT CHOKEBERRY), 2" CALIPER, 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 as described.

**Basis of Payment:** This work will be paid for at the contract unit price per each for TREE, GINKGO BILOBA (GINKGO), 2-1/2" CALIPER, BALLED AND BURLAPPED; TREE, ULMUS PATRIOT, (PATRIOT ELM), 2-1/2" CALIPER, BALLED AND BURLAPPED; TREE, QUERCUS ROBUR FASTIGIATA (FASTIGATE ENGLISH OAK), 2-1/2" CALIPER, BALLED AND BURLAPPED; and TREE, PRUNUS VIRGINIANA SCHUBERT (SCHUBERT CHOKEBERRY), 2" CALIPER, BALLED AND BURLAPPED.

**ITEM 122      \*\*\*\*\*      TRENCH AND BACKFILL WITH SCREENINGS**

**Description:** This work consists of excavating a trench for the installation of conduit and backfilling with limestone screenings as a portion of the total backfill of the trench, all as shown in Bureau of Electricity Standard Drawings No. 579 and No. 813. This work must meet all applicable requirements of Section 815 of the Standard Specifications.

**Materials:** Underground Cable Marking Tape must meet the requirements of Article 1066.05 of the Standard Specifications. Backfill must meet the requirements of Article 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 in the trench. 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 Article 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:** TRENCH AND BACKFILL WITH SCREENINGS 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.

DRAWINGS

813

579

January 1, 2002

**ITEM 123      \*\*\*\*\*      TRENCH AND BACKFILL FOR 2 TO 4 DUCTS**

**Description:** This work consists of excavating a trench for the installation of a two 3 inch or two 4 inch or a four 3 inch or a four 4 inch duct conduit package, encased in concrete, and backfilling with limestone screenings as a portion of the total backfill of the trench.

**Materials:** Underground Cable Marking Tape must meet the requirements of Article 1066.05 of the Standard Specifications. Backfill must meet the requirements of Article 1003.04 of the Standard Specifications.

**Construction Requirements:** The trench must be not less than three feet ten inches (3'-10") deep to provide a minimum thirty inches (30") of cover over the concrete encased conduit to be installed in the trench. The trench must be between eighteen and twenty-four inches (18"-24") in width and must not exceed twenty-four inches (24") 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. 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 or bank sand 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 Article 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:** TRENCH AND BACKFILL FOR 2 TO 4 DUCTS 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. Only one measurement will be made for the trench regardless of the number of conduit in the trench.

**Basis of Payment:** This work will be paid for at the contract unit price per lineal foot, measured with duct in place, for TRENCH AND BACKFILL FOR 2 TO 4 DUCTS. Such price will include the cost of all excavation, furnishing and placing all backfill material, and disposal of all surplus excavated material. Conduit and encasement will be paid for separately and are not included in this pay item. If sidewalk, driveway pavement or pavement must be removed and replaced, such work will be paid for separately.

April 2, 2001

<b>ITEM 124</b>	<b>*****</b>	<b><u>ELECTRICAL HANDHOLE 30"X36", WITH 24" FRAME AND LID</u></b>
<b>ITEM 125</b>	<b>*****</b>	<b><u>ELECTRICAL HANDHOLE HEAVY DUTY, 36"X36", WITH 24" FRAME AND LID</u></b>

**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.

**Materials:** 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. Bricks must meet the requirements of Section 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 or Drawing Number 866, 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 Article 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 Sections 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:** ELECTRICAL HANDHOLE, 30"X36", WITH 24" FRAME AND LID, and ELECTRICAL HANDHOLE, HEAVY DUTY, 36"X36", WITH 24" FRAME AND LID will be paid for at the contract unit price per each unit installed.

**Basis of Payment:** The necessary QC/QA procedures, excavation, backfilling, and restoration of parkway and pavement must be made in accordance with foregoing specifications, and the cost thereof must be included in the unit price each for installing ELECTRICAL HANDHOLE, 30"X36", WITH 24" FRAME AND LID, or ELECTRICAL HANDHOLE, HEAVY DUTY, 36"X36", 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.



LAKE STREET RECONSTRUCTION  
DAMEN AVENUE TO ASHLAND AVENUE  
CDOT PROJECT NO.: B-4-118

AUGUST 2017

MATERIAL SPECIFICATION  
1458 1528

DRAWING  
866 874 867 872

January 1, 2002

**ITEM 126 \*\*\*\*\* ELECTRICAL MANHOLE 3'X4'X4', WITH 24" FRAME AND LID**

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

**Materials:** 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. The ground rod must meet the requirements of Material Specification 1465. Bricks must meet the requirements of Section 1041 of the Standard Specifications. All other materials used must meet the appropriate material requirements of the Standard Specifications.

**Method of Construction:** The manhole must 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 must be as shown on the construction plans.

Each manhole must 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 must be properly disposed of per Article 202.03 of the Standard Specifications. Each manhole must be set or constructed to conform to the appropriate City of Chicago drawings, except that the number and size of conduit openings must 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 must 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 Sections 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 present handhole and construction of new manhole. Present laterals must be cut back to terminate at required distance from inner face of manhole wall. Cost of cutting back present laterals must be included in cost of new manhole. New laterals terminating in the manhole must be included in 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 included in this pay item.

**Method of Measurement:** ELECTRICAL MANHOLE 3'X4'X4', WITH 24" FRAME AND LID will be paid for at the contract unit price per each unit installed.

**Basis of Payment:** The unit price for installing manholes must include necessary QC/QA procedures, 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'X4'X4', WITH 24" FRAME AND LID.

MATERIAL SPECIFICATION 1458 1465 1528

DRAWING 730 872 April 4, 2001

**ITEM 127       \*\*\*\*\*       DRILL EXISTING ELECTRICAL MANHOLE OR HANDHOLE**

**Description:** This work consists of drilling a hole in an existing handhole or manhole for the installation of a new conduit. This item must meet the requirements of Section 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. A conduit of the size required must be installed in the drilled hole. The conduit must be installed in the drilled hole with a bushing before the hole is grouted. The space between the conduit and the handhole or manhole must be caulked with a waterproof grout. Drawing 814 provides additional information.

**Method of Measurement:** DRILL EXISTING ELECTRICAL MANHOLE OR HANDHOLE 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 ELECTRICAL MANHOLE OR HANDHOLE, which price will be payment in full for drilling the hole, grouting, and any additional work required to accomplish this task.

DRAWING  
814

January 1, 2002

**ITEM 128      \*\*\*\*\*      CLEAN EXISTING ELECTRICAL 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 Article 202.03 of the Standard Specifications should be followed.

**Method of Measurement:** CLEAN EXISTING ELECTRICAL MANHOLE OR HANDHOLE 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 ELECTRICAL MANHOLE OR HANDHOLE, as directed by the Resident Engineer, which payment will include both cleaning and debris disposal.

January 1, 2002

**ITEM 129      \*\*\*\*\*      REBUILD EXISTING MANHOLE ROOF**

**Description:** This item will consist of removing the existing roof of an existing manhole due to its condition or to its relationship to the new grade, where adjusting the frame and cover will not be sufficient.

**Material:** The frame and lid must be re-used, unless the plans call for new, in which case the frame and lid will be paid for under a separate pay item. Concrete must meet the requirements for Portland cement concrete, SI Class, in Article 1020 of the Standard Specifications. Dowel rods must meet the requirements of Section 1006.11 of the Standard Specifications. Reinforcement bars must meet the requirements of Section 1006.10 of the Standard Specifications.

**Construction:** The area above the roof will be excavated. Sidewalk or pavement will be removed if necessary. The existing roof must be broken down and all debris removed. All debris must be disposed of per Section 202.03 of the Standard Specifications. The existing manhole walls must be preserved. The existing walls will be keyed so as to form a better bond with the new concrete roof. Dowelling may be used by drilling holes in the existing walls and inserting reinforcement bars of sufficient size, and grouting. Wooden forms will be used to form the new concrete roof. The new roof will be poured in place and must be reinforced as per Drawing 729 or Drawing 730. The new roof must be dimensioned as per Drawing 729 or Drawing 730.

The roof for parkway or sidewalk areas must accommodate a 24" frame and lid. The roof for a roadway must accommodate a 30" frame and lid.

The parkway must be restored to grade. Pavement must be properly restored to the correct grade. Patching of the pavement will 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 and free of all debris.

**Method of Measurement:** REBUILD EXISTING MANHOLE ROOF will be measured per each unit installed complete.

**Basis of Payment:** This work will be paid for at the contract unit price, and will include all excavation, backfilling, and restoration of parkway, sidewalk, and pavement. The unit measurement will be each for REBUILD EXISTING MANHOLE ROOF. Removal of sidewalk or pavement will be paid for separately. New frames and lids will be paid for separately.

DRAWINGS  
729 730

April 4, 2001

**ITEM 130 \*\*\*\*\* ELECTRICAL FRAME AND LID, 30"**

**Description:** This item will consist of adjusting or replacing an existing or new 30 inch frame and lid for an existing manhole or handhole to the new or existing grade. The existing manhole or handhole may be in the street, in the sidewalk, or in the parkway.

**Material:** The 30 inch frame and lid must be as shown in Standard Drawings 874 and 10927. All frames and lids must conform to Material Specification 1458. Bricks must meet the requirements of Article 1041 of the Standard Specifications.

**Installation:** Pavement, sidewalk, and dirt must be removed to the extent necessary to adjust the frame. Material must be disposed of according to the requirements of Section 202.03 of the Standard Specifications. Mortar and brick, or mortar and concrete rings, must be used to adjust to the proper grade. With the approval of the Resident Engineer, the contractor may use precast adjusting rings. Adjustment rings, bricks, and frames are to be set in a full mortar bed. Mortar must be mixed in a proportion of one (1) part cement to three (3) parts sand by volume of dry mix. The interior of the adjustment must be smooth. 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 or handhole exceed two (2) feet in depth.

The pavement, sidewalk, or parkway must be restored to the proper grade after adjustment. Patching of pavement around a structure must be with high early strength concrete meeting the requirements of Articles 1001 and 1020 of the Standard Specifications. The bituminous concrete layer must be properly restored. Sidewalk must be replaced to the nearest full slab, or expansion joint, and must be a minimum of 5 inches in thickness. Parkways must be properly backfilled and topped with appropriate soil material.

**Method of Measurement:** ELECTRICAL FRAME AND LID, 30" will be measured on an each basis.

**Basis of Payment:** This work will be paid for at the contract price per each unit for ELECTRICAL FRAME AND LID, 30". All excavation and restoration, as well as bricks, concrete, mortar, backfill, soil, disposal of surplus excavated material, reinforcement bars, frames and lids, etcetera will be included in the unit price.

MATERIAL  
1458

DRAWINGS  
874 10927

January 1, 2002

<b>ITEM 131</b>	<b>*****</b>	<b>CONDUIT IN TRENCH, 3" DIA., GALVANIZED STEEL</b>
<b>ITEM 132</b>	<b>81100220 -</b>	<b>CONDUIT ATTACHED TO STRUCTURE, 3/4" DIA., PVC</b>
		<b>COATED, GALVANIZED STEEL</b>
<b>ITEM 133</b>	<b>*****</b>	<b>CONDUIT ATTACHED TO STRUCTURE, 1 1/2" DIA., PVC</b>
		<b>COATED GALVANIZED STEEL</b>
<b>ITEM 134</b>	<b>*****</b>	<b>PVC CONDUIT IN TRENCH 1" (SCHEDULE #40)</b>
<b>ITEM 135</b>	<b>*****</b>	<b>PVC CONDUIT IN TRENCH 2" (SCHEDULE #40)</b>
<b>ITEM 136</b>	<b>*****</b>	<b>PVC CONDUIT IN TRENCH 2 1/2" (SCHEDULE #40)</b>
<b>ITEM 137</b>	<b>*****</b>	<b>PVC CONDUIT IN TRENCH 3" (SCHEDULE #40)</b>
<b>ITEM 138</b>	<b>*****</b>	<b>PVC CONDUIT IN TRENCH 4" (SCHEDULE #40)</b>
<b>ITEM 139</b>	<b>*****</b>	<b>PVC CONDUIT IN TRENCH 2" (SCHEDULE #80)</b>
<b>ITEM 140</b>	<b>*****</b>	<b>PVC CONDUIT IN TRENCH 3" (SCHEDULE #80)</b>
<b>ITEM 141</b>	<b>*****</b>	<b>PVC CONDUIT IN TRENCH 4" (SCHEDULE #80)</b>

**Description:** This work consists of furnishing and installing conduit laterals of the type and size specified.

**MATERIALS:** Galvanized rigid steel conduit and PVC coated steel conduit must conform to the requirements of Material Specification 1462. Polyvinyl chloride (PVC) conduit must conform to the requirements of Material Specification 1533 and to the requirements of the National Electrical Manufacturers Association Standard, Publication Number TC2 for EPC-40, or EPC-80. Conduit color will be determined by the Resident Engineer.

Coilable non-metallic conduit must be a high density polyethylene meeting the requirements of Material Specification 1533 and ASTM-D1248, Type III, Grade PE34, Category 5, and Class C. The duct must meet the requirements of Article 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 Commissioner. 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 must normally be installed in a trench or attached to a structure. 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 conduit must have 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 must 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 must 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 splicings, where required, will be considered included in the cost of the contract.

**Method of Measurement:** The length paid for will be the number of lineal feet of CONDUIT IN TRENCH, 2" DIA., GALVANIZED STEEL; CONDUIT ATTACHED TO STRUCTURE, 3/4" DIA., PVC COATED GALVANIZED STEEL; CONDUIT ATTACHED TO STRUCTURE, 1 1/2" DIA., PVC COATED GALVANIZED STEEL; PVC CONDUIT IN TRENCH 1" (SCHEDULE #40); PVC CONDUIT IN TRENCH 2" (SCHEDULE #40); PVC CONDUIT IN TRENCH 2 1/2" (SCHEDULE #40); PVC CONDUIT IN TRENCH 3" (SCHEDULE #40); PVC CONDUIT IN TRENCH 4" (SCHEDULE #40); PVC CONDUIT IN TRENCH 2" (SCHEDULE #80); PVC CONDUIT IN TRENCH 3" (SCHEDULE #80); or PVC CONDUIT IN TRENCH 4" (SCHEDULE #80) 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 foot for CONDUIT IN TRENCH, 2" DIA., GALVANIZED STEEL; CONDUIT ATTACHED TO STRUCTURE, 3/4" DIA., PVC COATED GALVANIZED STEEL; CONDUIT ATTACHED TO STRUCTURE, 1 1/2" DIA., PVC COATED GALVANIZED STEEL; PVC CONDUIT IN TRENCH 1" (SCHEDULE #40); PVC CONDUIT IN TRENCH 2" (SCHEDULE #40); PVC CONDUIT IN TRENCH 2 1/2" (SCHEDULE #40); PVC CONDUIT IN TRENCH 3" (SCHEDULE #40); PVC CONDUIT IN TRENCH 4" (SCHEDULE #40); PVC CONDUIT IN TRENCH 2" (SCHEDULE #80); PVC CONDUIT IN TRENCH 3" (SCHEDULE #80); or PVC CONDUIT IN TRENCH 4" (SCHEDULE #80), which price will be payment in full for furnishing and installing the conduit and fittings complete and junction boxes. 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. No additional payment will be allowed for pushing under pavements or jackholes for conduit laterals.

MATERIAL SPECIFICATIONS  
1462 1533

DRAWINGS  
579 813

August 29, 2006

**ITEM 142 \*\*\*\*\* CONCRETE FOUNDATION FOR TYPE "P" BASE MOUNTED  
TRAFFIC SIGNAL CONTROLLER**

**Description:** This item consists of all work necessary for installing a foundation for a "P" cabinet. The QC/QA provisions of IDOT check sheet number 31 will also apply.

**Materials:** Concrete will be Portland cement concrete, SI Class, meeting the requirements of Section 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 must install a concrete foundation for a base mounted traffic signal controller cabinet, as shown on City of Chicago Drawing Number 888 for a "P" cabinet. Work under this item must be performed in accordance with Section 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 must 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 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 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:** CONCRETE FOUNDATION FOR TYPE "P" BASE MOUNTED TRAFFIC SIGNAL CONTROLLER CABINET will be measured as each for each unit installed complete.

**Basis of Payment:** Unit price will include cost of all QC/QA procedures, material, and labor required to install this foundation, as per applicable construction plans and these specifications. The conduit elbows will be considered as part of the foundation and will not be paid for as a separate item or as part of the conduit laterals leading to the foundation. All necessary excavation and restoration of parkway to the original condition will be included in the unit price. Any sidewalk removal will be paid for as a separate pay item. However, any restoration of sidewalk will be considered as part of this item, including any expansion joint between the sidewalk and the foundation. This work will be paid for at the Contract Unit Price of each for CONCRETE FOUNDATION FOR TYPE "P" BASE MOUNTED TRAFFIC SIGNAL CONTROLLER CABINET.

MATERIAL SPECIFICATION  
1462  
1465  
1533

DRAWING  
888  
11825

August 8, 2006

**ITEM 143      \*\*\*\*\*      CONCRETE FOUNDATION FOR BASE MOUNTED, STREET  
LIGHT CONTROLLER**

**Description:** The Contractor must install a concrete foundation for a base mounted street light controller cabinet, as shown on City of Chicago Drawing Number 880.

**Materials:** Concrete will be Portland cement concrete, SI Class, meeting the requirements of Section 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 880. Work under this item will be performed in accordance with Division 800 of the Standard Specifications.

The foundation will have a minimum depth of at least forty-eight inches (48") below grade and must have large radius conduit elbows in quantity, size and type shown. The elbow ends above ground must 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:** CONCRETE FOUNDATION, STREET LIGHT CONTROLLER will be paid for at the contract unit price per each unit installed complete.

**Basis of Payment:** Unit price will include cost of all QC/QA procedures, 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 each for CONCRETE FOUNDATION, STREET LIGHT CONTROLLER.

MATERIAL SPECIFICATION  
1465  
1467  
1533

DRAWING  
880  
11825

**ITEM 144      \*\*\*\*\*      CONCRETE FOUNDATION, 20" DIAMETER, 3/4" ANCHOR  
RODS, 5 FEET**

**Description:** This foundation will be for structural support of a traffic signal post. The foundation must be poured in place and must be 20" in diameter, with a 13" bolt circle, 3/4" diameter anchor rods, and must be 5 feet in depth.

**Materials:** Concrete must be Portland cement concrete meeting the requirements of Section 1020 of the Standard Specifications for SI Class concrete. Anchor rods must meet the requirements of Material Specification 1467 and the ground rod must meet the requirements of Material Specification 1465. Conduit must be PVC meeting the requirements of Material Specification 1533.

**Construction:** Foundations must conform to drawing number 709. Top surface of these foundations must be at an elevation of two inches (2) above grade or as required by the Resident Engineer. Care must be taken to install a level foundation and to ensure adequate anchor rod projections for double-nut installation. The foundation top must be chamfered 3/4 of an inch. The foundations must be centered back from the face of the curb in accordance with dimensions shown on the construction plans. When the foundation is in a solid sidewalk area, the foundation must be installed level, with the height of the foundation as close to the height of the sidewalk as possible, or as directed by the Engineer. A proper expansion joint must be installed between the sidewalk and the foundation.

Foundation raceways must consist of large radius conduit elbow(s) in quantity, size and type specified on Drawing 709 or as indicated on the construction plans. Elbows, in excess of those shown on Drawing 709, will be paid for separately under an additional pay item. The elbow ends above ground must be capped with standard conduit bushings. The Contractor must furnish anchor rods, hardware, conduit elbow(s) and all other material shown on applicable foundation construction drawings. Depth of foundation must be as noted on Drawing 709.

The anchor rods must be set by means of a metal template which must be submitted for approval before any foundation work is begun. The template must hold the rods vertical, and in proper position.

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

**Method of Measurement:** The measurement of CONCRETE FOUNDATION, 20" DIAMETER, 3/4" ANCHOR RODS, 5 FEET, will be based on each foundation installed complete.

**Basis of Payment:** Payment will be made for foundations installed in place including an elbow in accordance with construction plans and these specifications. All necessary QC/QA procedures, excavation, and restoration of parkway, or sidewalk and expansion joint will be included in the unit price. This work will be paid for at the contract unit price per each for CONCRETE FOUNDATION, 20" DIAMETER, 3/4" ANCHOR RODS, 5 FEET.

MATERIAL SPECIFICATION  
1465    1467    1533

DRAWING  
709    844    11825

August 8, 2006

<b>ITEM 145</b>	<b>*****</b>	<b><u>CONCRETE FOUNDATION, 24" DIAMETER, 1 1/4" ANCHOR RODS, 15" BOLT CIRCLE, 7 FEET</u></b>
<b>ITEM 146</b>	<b>*****</b>	<b><u>CONCRETE FOUNDATION, 30" DIAMETER, 1" ANCHOR RODS, 15" BOLT CIRCLE, 7 FEET</u></b>

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

**Materials:** Concrete must be Portland cement concrete meeting the requirements of Section 1020 of the Standard Specifications for SI class concrete. Reinforcement bars must meet the requirements of Article 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 must be installed at the location designated and in the manner herein specified or in special cases as specifically directed. The contractor must locate foundations as per plan or as directed by the Resident Engineer. A hole must be augured for placement of the concrete form.

Item 221 is a foundation for a traffic pole which can accommodate a 16, 20, or 26 foot monotube arm (Standard Drawing 818). Item 222 is a foundation for a traffic pole which can accommodate a 30 foot monotube arm (Standard Drawing 816). Item 223 is a foundation for a traffic pole which can accommodate a 35, 40, or 44 foot monotube arm (Standard Drawing 817). Item 219 is a foundation for arterial street light pole; either steel or aluminum, conventional or davit (Standard Drawing 818). Item 220 is an offset foundation for an arterial street light pole (Standard Drawing 937).

Top surface of these foundations must 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 construction plans. Foundation raceways must consist of large radius conduit elbow(s) in quantity, size and type specified on the corresponding standard drawing or in the construction plans. The elbow ends above ground must 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 must 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 must 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 must be properly oriented as indicated on the construction plans. The anchor rods must be set by means of a metal template which must be submitted for approval before any foundation work is begun. The template must hold the rods vertical, and in proper position. Anchor rods must conform in all respects to the appropriate City drawing.

**Method of Measurement:** This item will be measured per each CONCRETE FOUNDATION, 24" DIAMETER, 1 1/4" ANCHOR RODS, 15" BOLT CIRCLE, 7 FEET, or CONCRETE

FOUNDATION, 30" DIAMETER, 1" ANCHOR RODS, 15" BOLT CIRCLE, 7 FEET 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 QC/QA procedures, 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 for CONCRETE FOUNDATION, 24" DIAMETER, 1 1/4" ANCHOR RODS, 15" BOLT CIRCLE, 7 FEET, or CONCRETE FOUNDATION, 30" DIAMETER, 1" ANCHOR RODS, 15" BOLT CIRCLE, 7 FEET.

MATERIAL SPECIFICATION  
1465      1467      1533

DRAWING  
811 818 11825 837 844 956

August 8, 2006

**ITEM 147      \*\*\*\*\*      HELIX FOUNDATION, 5' 10" B.C., 4 ANCHOR BOLTS**

**Description:** This item will include furnishing and installing a steel light pole foundation, as shown on the plans or as directed by the Engineer, of the size indicated. Proper size anchor bolts and hardware will be furnished for each foundation.

**Material:** The steel foundation must meet the applicable requirements of Section 1070.01 of the Standard Specifications unless specified differently here and in City Material Specification 1526. Each anchor rod must have a hex head. In addition, each anchor rod must include a washer and nut for tightening. Each anchor bolt and associated hardware must be hot dipped galvanized and must meet the applicable requirements of Material Specification 1467. The foundation for residential light poles must have a 10 inch bolt circle for 4 bolts. The shaft length must be 5 feet. The base plate must be 12 inches square. The bolts must be one inch in diameter and 5 inches in thread length. The bolts must meet the applicable requirements of Standard Drawing 830. Each steel foundation must meet the applicable requirements of Standard Drawing 936.

**Installation:** The installation must follow the requirements of Article 836.03 (d) of the Standard Specifications for metal foundations. The foundation must be plumb with the base plate level with the existing grade. If installed in a sidewalk, the helix must be set lower than the sidewalk and topped with concrete level to the top of the sidewalk. An expansion joint must also be installed. Any improperly installed or damaged foundations will be replaced at no additional cost.

**Method of Measurement:** This item will be measured per each HELIX FOUNDATION, 5' 10" B.C., 4 ANCHOR BOLTS installed, complete.

**Basis of Payment:** This work will be paid for at the contract unit price per each HELIX FOUNDATION, 5' 10" B.C., 4 ANCHOR BOLTS, which payment will include all material and labor to properly provide and install the foundation.

MATERIAL SPECIFICATIONS  
1467 1526 1465

DRAWINGS  
936 830



<b>ITEM 148</b>	<b>*****</b>	<b>ELBOW, CONDUIT, STEEL 2" ON POLE OR STRUCTURE</b>
<b>ITEM 149</b>	<b>*****</b>	<b>ELBOW, CONDUIT, STEEL 2 1/2" ON POLE OR STRUCTURE</b>

**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.

**Materials:** 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 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 (11) inches 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:** ELBOW, CONDUIT, STEEL, 2" ON POLE OR STRUCTURE, or ELBOW, CONDUIT, STEEL, 2 1/2" ON POLE OR STRUCTURE will be measured per each elbow installation, complete.

**Basis of Payment:** ELBOW, CONDUIT, STEEL, 2" ON POLE OR STRUCTURE or ELBOW, CONDUIT, STEEL, 2 1/2" ON POLE OR STRUCTURE 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  
1462

<b>ITEM 150</b>	<b>*****</b>	<b>POLE, STEEL, ANCHOR BASE, 10" DIA., 7-GAUGE, 34'-6"</b>
<b>ITEM 151</b>	<b>*****</b>	<b>20' STEEL POLE, 10" B.C., 1" A.R.</b>

**Description:** These items 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.

**Materials:** The material of the pole must meet the requirements of Material Specification 1447.

**Method of 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 washer provided with the anchor bolts. The bolt covers, handhole cover, and pole cap must be securely attached.

The contractor must utilize non-abrasive slinging materials and must otherwise exercise due care in erecting the pole and mast arm to minimize any possible damage to the finish. When necessary, the contractor must 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:** POLE, STEEL, ANCHOR BASE, 10" DIA., 7-GAUGE, 34'-6" and 20' STEEL POLE, 10" B.C., 1" A.R. 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, 10" DIA., 7-GAUGE, 34'-6" and 20' STEEL POLE, 10" B.C., 1" A.R., which will be payment in full for furnishing and installing the pole complete in place. Light standard foundations, mast arms, and luminaires will not be included in this pay item but will be paid for separately.

MATERIAL SPECIFICATION  
1447

DRAWINGS  
837 808

April 12, 2001

<b>ITEM 152</b>	<b>*****</b>	<b>MAST ARM, STEEL, 4 FOOT WITH POLE PLATE</b>
<b>ITEM 153</b>	<b>*****</b>	<b>MAST ARM, STEEL, 8 FOOT WITH POLE PLATE</b>
<b>ITEM 154</b>	<b>*****</b>	<b>MAST ARM, STEEL, 12 FOOT WITH POLE PLATE</b>

**Description:** These items consist of furnishing and installing a steel pipe mast arm of a specified length to support a traffic signal head, or other electrical equipment as required, as is shown on Drawing Number 834.

**Materials:** 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 two bolt arm attachment must be equal to that shown on Standard Drawing 724.

**Method of Installation:** The 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 truss arm will be attached with 4 bolts. Bolts will be supplied with the arm per Material Specification 1450.

**Method of Measurement:** MAST ARM, STEEL, 4 FOOT WITH POLE PLATE; MAST ARM, STEEL, 8 FOOT WITH POLE PLATE; and MAST ARM, STEEL, 12 FOOT WITH POLE PLATE will be measured per each unit installed.

**Basis of Payment:** This work will be paid for at the contract unit price each for a MAST ARM, STEEL, 4 FOOT WITH POLE PLATE; MAST ARM, STEEL, 8 FOOT WITH POLE PLATE; or MAST ARM, STEEL, 12 FOOT WITH POLE PLATE and which will be payment in full for furnishing and installing the mast arm complete in place.

MATERIAL SPECIFICATION  
1450

DRAWING  
620 659 661 839

May 23, 2004

**ITEM 155 \*\*\*\*\* PLATE, WELD TO POLE, 2-BOLT**

**Description:** This item will consist of furnishing and welding a mast arm attachment plate to a street light pole for the purpose of installing a street light mast arm to support traffic signal equipment or street lighting equipment.

**Materials:** The material of the plate must be a forged steel plate as manufactured by the Union Metal Company per their Drawing No. A2843C42. The arc welding rod must be the equivalent of a Eutectic Rod No. XH066.

**Method of Construction:** The orientation of the plate to position the mast arm relative to the street light mast arm will be as designated on the drawing. The plate must be positioned such that the center lines of the mast arm mounting bolt holes will be in a horizontal plane, and the face of the plate will be in a vertical plane when the pole is installed plumb. The plate must be mounted on the pole with the wire guide lip extending inside the pole and positioned at the bottom of a two (2) inch diameter mounting hole drilled in the pole. The drilled hole must be reamed or filed to remove all sharp edges which may damage cable during installation.

The plate must be electric arc welded with a continuous 3/16" fillet weld as per detail and notation on Standard Drawing 656, and the voids must be filled in at the top and bottom of the plate where the welding surface is not concentric with the pole. The height of the hole in the pole will be nominally fifteen (15) feet one (1) inch above the bottom of the pole base when the plate is used for a traffic signal installation. This height will be adjusted in each installation to meet the field criteria as specified in the following paragraph and table.

The governing criteria will be that the height of the bottom of the signal being installed, whether composed of three, four, or five sections, must be a minimum of fourteen (14) feet six (6) inches above the bottom of the pole base. The rise of the mast arm specified for the installation is also a controlling factor and the hole height must be located according to the following table for the various combinations listed.

Mast Arm <u>Length</u>	Hole Height <u>3 Sec. Or 4 Sec. Head</u>	Hole Height <u>5 Sec. Head</u>
4 Ft.	15' - 1"	16' - 3"
8 Ft.	14' - 5"	15' - 7"
12 Ft.	14' - 3"	15' - 5"

When a twelve (12) foot mast arm is used, a second plate must be welded to the pole in the same orientation at a position thirty-two (32) inches vertically below the first plate. When the plate is to be used for a street lighting installation for either double arming or mounting a lighting unit at a lower than normal height, the orientation and the height of the mounting hole will be as specified on the drawing.

The integrity of the weld between the mast arm support plate and the pole must be tested in the following manner. With an appropriate mast arm firmly attached to the pole, a test load of 300 pounds will be applied to the mast arm as a side pull at a point seven (7) feet from the pole. After the test, the mast arm support plate welds must be sound in all respects. This test must be performed with a time lapse of a minimum of two (2) hours following the welding, and the test must be performed with the Resident Engineer as a witness. In the event of a failed weld, the crack may be re-welded and the pole assembly retested.

The plate must be cleaned and painted. This will not constitute a separate cost item for painting.

**Method of Measurement:** PLATE, WELD TO POLE, 2-BOLT will be measured per each plate installed, complete with painting.

**Basis of Payment:** This work will be paid for at the contract unit price each for PLATE, WELD TO POLE, 2-BOLT, which price will be payment in full for furnishing and welding the plate.

**ITEM 156      \*\*\*\*\*      MAST ARM, STEEL, STREET LIGHTING, 1 FOOT**

**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 Number 661.

**Materials:** The material of the mast arm must conform to the requirements of Material Specification 1450. The 1 foot arm must conform to Standard Drawing 661. 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.

**Method of Installation:** The 1 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. Bolts will be supplied with the arm per Material Specification 1450.

**Method of Measurement:** MAST ARM, STEEL, STREET LIGHTING, 1 FOOT will be measured per each unit installed.

**Basis of Payment:** This work will be paid for at the contract unit price each for a MAST ARM, STEEL, STREET LIGHTING, 1 FOOT and which will be payment in full for furnishing and installing the mast arm complete in place.

MATERIAL SPECIFICATION  
1450

DRAWINGS  
659 661 724

May 23, 2004

**ITEM 157      \*\*\*\*\*      LUMINAIRE, LED COBRAHEAD ARTERIAL, LED TYPE III (400 WATT HPS EQUIVALENT)**

**Description:** This item will consist of furnishing and installing a street lighting luminaire, complete with internal electronic ballast, and an LED lamp of the proper wattage and input voltage, on a street light mast arm attached to a street light pole and connecting the unit to either an underground cable distribution system or an aerial wire distribution system at the location shown on the plans, or as directed by the Engineer.

**Materials:** The luminaire shall meet the appropriate material specification for the lamp wattage and type of distribution specified. This item shall meet Material Specification 1584. Luminaires to be either black or gray, or as specified by Engineer. All bolts, washers, and nuts must be stainless steel. All material will be subject to approval by the engineer.

**Material Acceptance:** The Contractor shall provide a Manufacturer's written certification that the materials comply with these specifications.

**Installation:** The luminaire shall be securely installed on the mast arm. The vertical axis of the luminaire shall be in a vertical plane, and the longitudinal axis shall be leveled as specified in shop drawings supplied by the manufacturer to produce the desired distribution pattern with the lamp socket secured in the required position for that distribution.

For an aerial distribution system, the primary wiring to the ballast shall consist of 2 1/C #12 AWG wires, with 150 degree C. irradiated polyolefin insulation, connected to the terminal board "line" terminals. They shall extend through the mast arm and exit from the mast arm through the grommet in the hole provided for this purpose, and extend further forming a drip loop and connect with aerial circuit wires. Connection to the aerial circuit wires shall be made with a split bolt type pressure connector for a No. 6 solid copper wire and the connection so formed shall be wrapped with two layers of an approved electrical tape.

A cartridge type fuse, type KTK, rated at 10 amperes shall be installed in each of the fuse holders. The primary wiring to the ballast shall consist of 2 1/C No. 12 AWG wires with 150 degree C. irradiated polyefin, insulation connected to the terminal board "line" terminals. They shall extend through the mast arm raceway and down the inside of the pole to the pole base where they shall be spliced to the underground feeder cables. Sufficient wire shall be supplied to extend the wires outside of the pole through the access handhole to permit splicing work to be performed outside the pole.

All splice methods shall be approved by the Engineer before implemented. All splices, tapes and grounding connections shall be inspected by the Commissioner's authorized representative before wires are permanently trained in the light pole.

Current, insulation resistance, and voltage readings shall be taken and tabulated by the Contractor for each circuit. These readings are to be witnessed by the Commissioner's authorized representative. Any indication of grounds, open, or crossed conductors shall be thoroughly investigated and remedied before acceptance of the installation. Line voltage shall be taken at any in line fused location, within the pole designated by the Commissioner's authorized representative. Locations and voltage shall be tabulated as directed. Three (3) copies of the tabulated voltage insulation resistance, and current readings shall be submitted to the Commissioner's authorized representative. Maximum voltage drop shall not exceed 10% of nominal source voltage. The insulation resistance shall not be less than 2 Megohms, when tested to ground with 500 volts A.C.

The Contractor shall submit the manufacturer's certified test reports on all materials used on this project. Any material deemed defective shall be removed and disposed of by the Contractor at his sole cost.

After the lighting installation has been completed and satisfactory current and voltage readings recorded, a field test shall be made to insure that all lighting and control equipment are in proper operating condition. This field test shall be witnessed by the Commissioner.

The Contractor shall furnish special test devices, tools and miscellaneous items that shall be required for the testing of cables and control equipment, all as herein specified.

**Method of Measurement:** LUMINAIRE, L.E.D. COBRAHEAD ARTERIAL, LED TYPE III (400 WATT HPS EQUIVALENT) will be measured per each unit installed, complete. All wiring to the underground feeder cable, including splices, will be included in this measurement.

**Basis of Payment:** This work will be paid for at the contract unit price each for a LUMINAIRE, L.E.D. COBRAHEAD ARTERIAL, LED TYPE III (400 WATT HPS EQUIVALENT) and mounting method, which will be payment in full for furnishing, installing, connecting and testing the unit complete in place.

MATERIAL SPECIFICATION  
1584



**ITEM 158      \*\*\*\*\*      LUMINAIRE, LED VIADUCT**

**Description:** This item will consist of furnishing and installing a viaduct luminaire, complete with internal electronic ballast, and an LED lamp of the proper wattage and input voltage, onto a CTA elevated structure and connecting the unit to either an underground cable distribution system or an aerial wire distribution system at the location shown on the plans, or as directed by the Engineer.

**Materials:** The luminaire shall meet the appropriate material specification for the lamp wattage and type of distribution specified. This item shall meet Material Specifications 1587. Luminaires to be either black or gray, or as specified by Engineer. All bolts, washers, and nuts must be stainless steel. Beam clamps and shock absorbers must be structurally sound. Shock absorbers will use steel springs for the mechanism. All material will be subject to approval by the engineer.

**Material Acceptance:** The Contractor shall provide a Manufacturer's written certification that the materials comply with these specifications.

**Installation:** The luminaire shall be securely installed on the CTA elevated structure. The vertical axis of the luminaire shall be in a vertical plane, and the longitudinal axis shall be leveled as specified in shop drawings supplied by the manufacturer to produce the desired distribution pattern with the lamp socket secured in the required position for that distribution.

For an installation onto a CTA elevated structure, the luminaire must be securely attached to two (2) shock absorbers, which in turn, will be mounted to the bottom flange of a steel beam. The steel beam attachment will be one of two kinds and as shown on the plans: the first kind will consist of beam clamps, the second kind will consist of drilling the steel and installing bolts. In either case, the attachment must be secure, and must withstand any vibrations occurring during normal service without loosening. A metallic whip, of not more than six (6) feet, must be provided and installed from the luminaire to the nearest junction box, to provide a wireway.

A cartridge type fuse, type KTK, rated at 10 amperes shall be installed in each of the fuse holders. The primary wiring to the ballast shall consist of 2 1/C No. 12 AWG wires with 150 degree C. irradiated polyefin, insulation connected to the terminal board "line" terminals. They shall extend through the mast arm raceway and down the inside of the pole to the pole base where they shall be spliced to the underground feeder cables. Sufficient wire shall be supplied to extend the wires outside of the pole through the access handhole to permit splicing work to be performed outside the pole.

All splice methods shall be approved by the Engineer before implemented. All splices, tapes and grounding connections shall be inspected by the Commissioner's authorized representative before wires are permanently trained in the light pole.

Current, insulation resistance, and voltage readings shall be taken and tabulated by the Contractor for each circuit. These readings are to be witnessed by the Commissioner's authorized representative. Any indication of grounds, open, or crossed conductors shall be thoroughly investigated and remedied before acceptance of the installation. Line voltage shall be taken at any in line fused location, within the pole designated by the Commissioner's authorized representative. Locations and voltage shall be tabulated as directed. Three (3) copies of the tabulated voltage insulation resistance, and current readings shall be submitted to the Commissioner's authorized representative. Maximum voltage drop shall not exceed 10% of nominal source voltage. The insulation resistance shall not be less than 2 Megohms, when tested to ground with 500 volts A.C.

The Contractor shall submit the manufacturer's certified test reports on all materials used on this project. Any material deemed defective shall be removed and disposed of by the Contractor at his sole cost.

After the lighting installation has been completed and satisfactory current and voltage readings recorded, a field test shall be made to insure that all lighting and control equipment are in proper operating condition. This field test shall be witnessed by the Commissioner.

The Contractor shall furnish special test devices, tools and miscellaneous items that shall be required for the testing of cables and control equipment, all as herein specified.

**Method of Measurement:** LUMINAIRE, LED VIADUCT will be measured per each unit installed, complete. All wiring to the underground feeder cable, including splices, will be included in this measurement.

**Basis of Payment:** This work will be paid for at the contract unit price each for a LUMINAIRE, LED VIADUCT and mounting method, which will be payment in full for furnishing, installing, connecting and testing the unit complete in place.

MATERIAL SPECIFICATION  
1587

**ITEM 159      \*\*\*\*\*      ALLEY LUMINAIRE, 54W LED**

**Description:** This item will consist of furnishing and installing a street lighting luminaire, complete with internal electronic ballast, and an LED lamp of the proper wattage and input voltage, on a street light mast arm attached to a street light pole and connecting the unit to either an underground cable distribution system or an aerial wire distribution system at the location shown on the plans, or as directed by the Engineer.

**Materials:** The luminaire shall meet the appropriate material specification for the lamp wattage and type of distribution specified. This item shall meet Material Specification 1600. Luminaires to be either black or gray, or as specified by Engineer. All bolts, washers, and nuts must be stainless steel. All material will be subject to approval by the engineer.

**Material Acceptance:** The Contractor shall provide a Manufacturer's written certification that the materials comply with these specifications.

**Installation:** The luminaire shall be securely installed on the mast arm. The vertical axis of the luminaire shall be in a vertical plane, and the longitudinal axis shall be leveled as specified in shop drawings supplied by the manufacturer to produce the desired distribution pattern with the lamp socket secured in the required position for that distribution.

For an aerial distribution system, the primary wiring to the ballast shall consist of 2 1/C #12 AWG wires, with 150 degree C. irradiated polyolefin insulation, connected to the terminal board "line" terminals. They shall extend through the mast arm and exit from the mast arm through the grommet in the hole provided for this purpose, and extend further forming a drip loop and connect with aerial circuit wires. Connection to the aerial circuit wires shall be made with a split bolt type pressure connector for a No. 6 solid copper wire and the connection so formed shall be wrapped with two layers of an approved electrical tape.

A cartridge type fuse, type KTK, rated at 10 amperes shall be installed in each of the fuse holders. The primary wiring to the ballast shall consist of 2 1/C No. 12 AWG wires with 150 degree C. irradiated polyefin, insulation connected to the terminal board "line" terminals. They shall extend through the mast arm raceway and down the inside of the pole to the pole base where they shall be spliced to the underground feeder cables. Sufficient wire shall be supplied to extend the wires outside of the pole through the access handhole to permit splicing work to be performed outside the pole.

All splice methods shall be approved by the Engineer before implemented. All splices, tapes and grounding connections shall be inspected by the Commissioner's authorized representative before wires are permanently trained in the light pole.

Current, insulation resistance, and voltage readings shall be taken and tabulated by the Contractor for each circuit. These readings are to be witnessed by the Commissioner's authorized representative. Any indication of grounds, open, or crossed conductors shall be thoroughly investigated and remedied before acceptance of the installation. Line voltage shall be taken at any in line fused location, within the pole designated by the Commissioner's authorized representative. Locations and voltage shall be tabulated as directed. Three (3) copies of the tabulated voltage insulation resistance, and current readings shall be submitted to the Commissioner's authorized representative. Maximum voltage drop shall not exceed 10% of nominal source voltage. The insulation resistance shall not be less than 2 Megohms, when tested to ground with 500 volts A.C.

The Contractor shall submit the manufacturer's certified test reports on all materials used on this project. Any material deemed defective shall be removed and disposed of by the Contractor at his sole cost.

After the lighting installation has been completed and satisfactory current and voltage readings recorded, a field test shall be made to insure that all lighting and control equipment are in proper operating condition. This field test shall be witnessed by the Commissioner.

The Contractor shall furnish special test devices, tools and miscellaneous items that shall be required for the testing of cables and control equipment, all as herein specified.

**Method of Measurement:** ALLEY LUMINAIRE, 54W LED will be measured per each unit installed, complete. All wiring to the underground feeder cable, including splices, will be included in this measurement.

**Basis of Payment:** This work will be paid for at the contract unit price each for an ALLEY LUMINAIRE, 54W LED and mounting method, which will be payment in full for furnishing, installing, connecting and testing the unit complete in place.

MATERIAL SPECIFICATION  
1600

**ITEM 160      \*\*\*\*\*      RACK, SECONDARY AERIAL 3 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.

**Method of Measurement:** RACK, SECONDARY AERIAL 3-WIRE will be measured per each unit installed, complete.

**Basis of Payment.** This work will be paid for at the contract price each for a RACK, SECONDARY AERIAL 3-WIRE, which price will be payment in full for furnishing and installing a secondary rack of the size stated on the contract plans on an existing pole. Any attachment of wires to the rack will be paid for as part of the cost of installing the wire.

MATERIAL SPECIFICATION  
1443

DRAWING  
11940

March 21, 1995

**ITEM 161       \*\*\*\*\*       CIRCUIT BREAKER, 1-POLE, 70 AMP, 600 VOLT IN EXISTING  
STREET LIGHTING CONTROLLER**

**Description:** This item consists of furnishing and installing a single 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.

**Materials:** 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 must 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 must 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 must 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 must 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.

**Method of Measurement:** CIRCUIT BREAKER, 1-POLE, 70 AMPERE, 600 VOLT IN EXISTING STREET LIGHTING CONTROLLER will be measured on an each basis.

**Basis of Payment:** This item will be paid for at the contract unit price each for a CIRCUIT BREAKER, 1-POLE, 70 AMPERE, 600 VOLT IN EXISTING STREET LIGHTING 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

March 21, 1995

**ITEM 162      \*\*\*\*\*      SERVICE INSTALLATION, 200 AMP**

**Description:** This work consists of furnishing and installing a service on a ComEd 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 meet 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, 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 ComEd 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 will be included in the price bid for the complete ComEd 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 ComEd secondary wires for connection. The three (3) conductor service entrance cable must meet the requirements of Bureau of Electricity Specification Number 1457. The black and red conductors must be connected to the disconnect, 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.

**Method of Measurement:** SERVICE INSTALLATION, 200 AMP will be measured on an each basis.

**Basis of Payment:** This work will be paid for at the contract unit price each for SERVICE INSTALLATION, 200 AMP, which price will 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.

LAKE STREET RECONSTRUCTION  
DAMEN AVENUE TO ASHLAND AVENUE  
CDOT PROJECT NO.: B-4-118

AUGUST 2017

MATERIAL SPECIFICATION  
1457, 1462

DRAWING  
11922, 11925

April 3, 2009



**ITEM 163      X0324900 - SERVICE CONNECTION TO CECO LINE**

**Description:** This work consists of providing a service connection from City cable to a ComEd secondary cable. For an aerial service, this will be on a wood pole. For an underground service, this will be in a ComEd manhole.

**Installation:** This work will consist of splicing or terminating City service cable to a ComEd secondary cable, as directed by the Engineer. The contractor must obtain permission from ComEd for the service at the required location. The contractor will inform ComEd of the load required. ComEd will make the connections, unless ComEd 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 TO CECO LINE 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 TO CECO LINE, which payment will be in full for providing all material and labor to make the necessary connections.

DRAWING  
11925

May 1, 2001

**ITEM 164      \*\*\*\*\*      ELECTRIC CABLE IN CONDUIT, TRIPLEX NO. 6, 2-1C AND NO. 8, 1-1C**

**Description:** This work consists 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.

**Materials:** The cable must meet all requirements of Material Specification 1534 of the Division of Electrical Operations, City of Chicago.

**Method of Construction:** 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 must be accomplished by means of reels mounted on jacks or other suitable devices located for unreeling cable directly into duct. Lubricants may be used to facilitate installation if deemed necessary by the contractor.

Bends in the cable must conform to the recommended minimum radius as outlined in the National Electric Code.

Cable passing through manholes must be trained and racked around the sides of the manhole into a permanent position. If racks are non-existent or in poor condition, the contractor must install racks. The material must be approved by the resident engineer. Any material and labor involved in training and racking the cable will be considered included in the cost of this pay item.

Where cable runs continue from manhole to manhole without tapping within a light pole, they must 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. 6 or 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 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 ELECTRIC CABLE IN CONDUIT, TRIPLEX, 2-1/C NO. 6 AND 1-1/C NO. 8 GROUND 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, TRIPLEX, 2-1/C NO. 6 AND 1-1/C NO. 8 GROUND. The price will be payment in full for furnishing, installing, and testing the cable, and will include all material, labor, terminations, incidentals and equipment necessary to complete the work as per the contract plans.

LAKE STREET RECONSTRUCTION  
DAMEN AVENUE TO ASHLAND AVENUE  
CDOT PROJECT NO.: B-4-118

AUGUST 2017

MATERIAL SPECIFICATION  
1534

August 14, 2006

**ITEM 165      \*\*\*\*\*      AERIAL CABLE, 3-1/C #6, WITH MESSENGER**

**Description.** This item will consist of furnishing and installing an electrical cable, designed for and designated 'self supporting', consisting of two insulated color coded conductors spirally wrapped around one bare conductor. The cable will be strung between poles and attached to cable supports on these poles. The conductors will be connected to other wires or cables for the purpose of extending electric power from a Commonwealth Edison Company power pole to a City electric power pole as shown on the plans, as specified herein, or as directed by the Commissioner.

**Material.** The material must meet the requirements of Material Specification 1432.

**Installation Requirements.** The cable must be installed with a nominal tension adequate to produce sag of approximately 9 inches in a 60 ft. span. The cable must be attached to a line pole by means of a suitable clamp which holds the neutral conductor. The clamp must be supported by a clamp support device appropriate for the type of pole in use. The cable must be dead ended at the City pole, and must be dead ended at the Commonwealth Edison Company pole. Ten feet of additional cable must be coiled and attached to the Commonwealth Edison Company pole for final connections.

**Method of Measurement.** AERIAL CABLE, 3-1/C #6, WITH MESSENGER will be measured per lineal foot of cable installed.

**Basis of Payment.** This work will be paid for at the contract unit price per foot for furnishing and installing AERIAL CABLE, 3-1/C #6, WITH MESSENGER, which will be payment in full for furnishing and installing this cable, including cable clamps and dead end devices, which will be considered incidental to this item.

MATERIAL SPECIFICATION  
1432

October 6, 2006

<b>ITEM 166</b>	<b>*****</b>	<b>ELECTRIC CABLE IN CONDUIT, 1/C, #4</b>
<b>ITEM 167</b>	<b>*****</b>	<b>ELECTRIC CABLE IN CONDUIT, 1/C, #10</b>
<b>ITEM 168</b>	<b>*****</b>	<b>ELECTRIC CABLE IN CONDUIT, 1/C, #2/0</b>

**Description:** This work will consist of furnishing and installing single conductor electric cable of the size specified. The cable will be installed in conduit.

**Materials:** The cable must meet all requirements of Material Specification 1534 of the Division of Electrical Operations, 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 must 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 must conform to the recommended minimum radius as outlined in the National Electric Code.

Cable passing through manholes must be trained and racked around the sides of the manhole into a permanent position. If racks are non-existent or in poor condition, the contractor must install racks. The material must be approved by the resident engineer. Any material and labor involved in training and racking the cable must be considered included in the cost of this pay item.

Where cable runs continue from manhole to manhole without tapping within a light pole, they must 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 ELECTRIC CABLE IN CONDUIT, 1/C, #10; ELECTRIC CABLE IN CONDUIT, 1/C, #4; or ELECTRIC CABLE IN CONDUIT, 1/C, #2/0 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. One foot of slack will be allowed at pull boxes, junction boxes, and similar locations.

**Basis of Payment:** This work will be paid for at the contract unit price per lineal foot for ELECTRIC CABLE IN CONDUIT, 1/C, #10;; ELECTRIC CABLE IN CONDUIT, 1/C, #4; or ELECTRIC CABLE IN CONDUIT, 1/C, #2/0. Such price will be payment in full for furnishing, installing, and testing the cable, and will include all material, labor, and equipment necessary to complete the work as per the contract plans.

MATERIAL SPECIFICATION  
1534

August 14, 2006

**ITEM 169 \*\*\*\*\* JUNCTION BOX, POLE OR POST MOUNTED**

**Description:** This item consists 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.

**Materials:** 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:** The measurement of JUNCTION BOX, POLE OR POST MOUNTED will be based on each junction box installed complete with elbows(s).

**Basis of Payment:** This work will be paid for at the contract unit price each for JUNCTION BOX, POLE OR POST MOUNTED. Such price will be payment in full for furnishing and installing the junction box complete with its component parts and appurtenances. Connection of cables and wires to the terminal strip will not be part of the cost of the junction box but will be considered part of the installation of the underground cable and the installation of signal heads.

MATERIAL SPECIFICATION  
1407

DRAWINGS  
954 11984

April 3, 2009

**ITEM 170      81300320 - JUNCTION BOX, STAINLESS STEEL, ATTACHED TO  
STRUCTURE, 8" X 8" X 6"**

**ITEM 171      81300710 - JUNCTION BOX, STAINLESS STEEL, ATTACHED TO  
STRUCTURE 16"X12"X6"**

**Description:** This work shall consist of furnishing and installing junction box or pull box of the type and size specified, as shown on the Plans and as directed by the Commissioner. Work under this item shall be performed in accordance with Section 813 of the Standard Specifications and as specified herein.

**Materials:** Materials shall be according to the following Bureau of Electricity (BOE) Specifications and Articles of Standard Specifications Section 1000-Materials:

Item.....	Article/Section Requirement
a. Stainless Steel Junction Box .....	1088.04

**Construction Requirements:** Exposed junction boxes on structure shall be installed on one-foot stainless struts, or as noted on plans. The exact orientation shall be as shown on the plans or as directed by the Engineer. Care shall be taken to assure proper orientation of mounting lugs.

**Basis of Payment:** This work will be paid for at the contract unit price each for JUNCTION BOX, STAINLESS STEEL, ATTACHED TO STRUCTURE, of the size as specified, which shall be payment in full for furnishing and installing the junction box and associated mounting hardware complete.

**ITEM 172 \*\*\*\*\* MAINTENANCE OF EXISTING TRAFFIC SIGNAL INSTALLATION**

**Description:** The Contractor must maintain the existing traffic signal system at each intersection in this Contract, as described in the special provision OPERATION OF TRAFFIC SIGNALS, which is a section of these specifications. The maintenance must commence on the Contract Start Date and continue until such date as the new or existing traffic signal system is accepted for operation and maintenance by the Bureau of Electricity or the Completion Date of the project, whichever is later. The acceptance conditions are noted in the special provision, TRAFFIC SIGNAL TURN ON, which is a section of these specifications.

Existing traffic signals may be used as temporary traffic signals during the construction period. The provision and use of temporary aerial cable, temporary traffic controllers, temporary traffic heads, temporary poles and all necessary cables and connections which may be required to relocate existing traffic signals to allow for the installed of the proposed improvements will be included in the pay item for TEMPORARY TRAFFIC SIGNAL INSTALLATION. A properly operating traffic signal system must be maintained by the Contractor at the following intersections: Lake Street at Damen Avenue, and Lake Street at Paulina Street.

**General Requirements:** Work under this item must be performed in accordance with Section 800, 801, 850, and 1085 of the Standard Specifications, Bureau of Electricity Standards and the City of Chicago Electrical Code, except as herein modified.

**Maintenance Procedures:** The Contractor must perform the following maintenance program:

Patrol and inspect the signal installation at least once each week for proper alignment of signal heads, lamp outages, and general operation of the traffic signals.

Provide immediate corrective action to replace burned out lamps or damaged sockets with new lamps or sockets of approved qualities. At the time of replacement, the reflector and lens must be cleaned.

Respond to emergency calls within two hours after notification and provide immediate corrective action. The Contractor must maintain in stock a sufficient amount of material and equipment to provide temporary and permanent repairs. Any damage to the signal installation from any cause whatsoever must be repaired or replaced by the Contractor at his own expense.

The Contractor must install STOP signs (R1-1-3636) on all approaches to the intersection as a temporary means of regulating traffic during the time of repair.

The Contractor must provide the Commissioner the names and telephone numbers of two individuals who will be available 24 hours a day, 7 days a week, to perform any necessary work on the signal installation.

**Method of Measurement:** MAINTENANCE OF EXISTING TRAFFIC SIGNAL INSTALLATION will be measured on an each basis, for each traffic signal installation. Each intersection will be paid for separately.

**Basis of Payment:** This work will be paid for at the contract unit price for MAINTENANCE OF EXISTING TRAFFIC SIGNAL INSTALLATION at a specified intersection on an each basis, which price will be payment in full for all materials, equipment, and labor necessary to maintain the signals in operation. Whether the old installation or the new installation, all signals must be



in operation between the Contract Start Date and the Date of Acceptance by the Bureau of Electricity or Contract Completion Date whichever is later.

<b>ITEM 173</b>	<b>*****</b>	<b>TRAFFIC SIGNAL POST, ALUMINUM 15 FT</b>
<b>ITEM 174</b>	<b>*****</b>	<b>TRAFFIC SIGNAL POST, ALUMINUM 17 FT</b>

**Description:** This item will consist of furnishing and installing an aluminum post, for supporting a traffic signal, upon a concrete foundation, at the location shown on the plans, as specified herein, or as directed by the Engineer. The post installation itself must be consistent in construction to the post shown on Drawing Number 526 for the installation of a post for a traffic signal.

**Materials:** The material of the post must meet the requirements of Material Specification 1385, and of Standard Drawing Number 526.

**Installation:** The post must be mounted on the foundation so that the handhole faces away from the curb. The nuts on the foundation must be tightened to secure the post to the foundation such that there is no space separating the post from the foundation. There must be no double nutting. The post must be plumb and the use of shims will not be permitted. The post cap must be secured by three (3) 5/16" No. 18 x 3/4" hex head stainless steel set screws.

The height of the post must be as indicated on the plans.

**Method of Measurement:** This work will be measured per each TRAFFIC SIGNAL POST, ALUMINUM 15 FT or TRAFFIC SIGNAL POST, ALUMINUM 17 FT installed on a foundation, complete with bolt covers, handhole door, base casting, aluminum pipe, and post cap.

**Basis of Payment:** This work will be paid for at the contract unit price each for TRAFFIC SIGNAL POST, ALUMINUM 15 FT and TRAFFIC SIGNAL POST, ALUMINUM 17 FT, which will be payment in full for furnishing and installing the post complete in place.

MATERIAL SPECIFICATION  
1385

DRAWING  
526

June 27, 2008

**ITEM 175      \*\*\*\*\*      SIGNAL HEAD, POLYCARBONATE, LED, 1-FACE, 3-SECTION, BRACKET MOUNTED**

**Description:** These items 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 Commissioner. Specific installations and configurations are shown on Drawing Numbers 834 and 835, entitled "Standard Traffic Signal Mounting Details".

The type of installation must 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 must 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.

**Head, Signal Materials:** The traffic signal head construction must meet the requirements of Material Specification 1543 for optically programmable LED signals. The mounting brackets must meet the requirements of Material Specification 1495, unless the Engineer deems that the signal heads are too heavy for this type of bracket. The cable must meet the requirements of Material Specification 1475.

**Installation Requirements:** The signals must be mounted using pole mounting brackets meeting Material Specification 1495, 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 be coated with a baked-on black finish. The mounting configuration connecting the signals to the mounting bracket must consist of sections of 1 1/2" galvanized steel conduit of precise lengths, as indicated on the standard drawings or polycarbonate brackets specifically made for mounting signal heads to the side of poles, to create the designated structure, connected with cross fittings, tees, etcetera to create the desired configuration.

When the signals are to be mounted on a square pole of flat surface, the bracket used will be bolted to the flat pole or surface using a 3/8" drive stud where permissible or using a 3/8" stud 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 #18 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 cord must be attached to the terminal block in the junction box in accordance with the terminal strip connector schematic, Drawing Number 12268-A.

The service cable from the signal heads must enter the pole through the bottom ULB-1 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 signal head housings, the pole mounting brackets, and the crosses must be of the color specified in the plans.

**Method of Measurement:** SIGNAL HEAD, POLYCARBONATE, LED, 1-FACE, 3-SECTION, BRACKET MOUNTED will be measured per each unit installed, complete.

**Basis of Payment:** This work will be paid for at the contract unit price for each SIGNAL HEAD, POLYCARBONATE, LED, 1-FACE, 3-SECTION, BRACKET MOUNTED, which price will be payment in full for furnishing and installing the signal head complete, including all necessary wiring.

MATERIAL SPECIFICATION

1475  
1493  
1495

DRAWING

834 12268a  
835 740  
741

April 16, 2001

**ITEM 176      \*\*\*\*\*      PEDESTRIAN SIGNAL HEAD, POLYCARBONATE, LED, 1-FACE, BRACKET MOUNTED WITH COUNT DOWN TIMER**

**Description:** This item consists 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 must be indicated on the plans. Each signal face must be pointed in the direction of the marked cross-walk area for the pedestrians it is intended to control.

**Materials:** 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 sections 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 cable entrance drilled into the pole or standard 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 must be installed using the same opening as the traffic signal cord.

When the pedestrian signal mounted to a CTA column, the length of conduit between the CTA column mounted junction box and the pedestrian signal will be included in the cost of the pedestrian signal and will not be measured for payment.

**Cable:** The Contractor must provide and install a length of 8/C #18 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:** PEDESTRIAN SIGNAL HEAD, POLYCARBONATE, LED, 1-FACE, BRACKET MOUNTED WITH COUNT DOWN TIMER 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 each for PEDESTRIAN SIGNAL HEAD, POLYCARBONATE, LED, 1-FACE, BRACKET MOUNTED WITH COUNT DOWN TIMER, which price will be payment in full for furnishing and installing the signal head complete.

MATERIAL SPECIFICATION

1494  
1495  
1475  
1545

DRAWING

12268a 740  
741  
834  
835

April 16, 2006

**ITEM 177      \*\*\*\*\*      CUT OFF POLE AND INSTALL CAP**

**Description:** This item consists of cutting a street light pole down to the desired height and furnishing and installing a steel cap for the pole top. New pole plates to mount the street light bracket arm must be welded to the pole to provide the proper mounting height for the luminaire as shown on the plans or as directed by the Commissioner.

**Materials:** The steel cap furnished must be in accordance with the requirements of Drawing #11420A.

**Installation:** A steel cap must be installed on the top of the pole and secured by three stainless steel set screws. The pole may be cut before or after installation.

**Method of Measurement:** CUT OFF POLE AND INSTALL CAP will be measured per each unit installed.

**Basis of Payment:** This work will be paid for at the contract unit price each for CUT OFF POLE AND INSTALL CAP. This price will be considered payment in full for all labor and material necessary to perform the work as described above.

**ITEM 178 \*\*\*\*\* ELECTRIC CABLE IN CONDUIT, SIGNAL NO. 14 19C**

**Description:** This work consists of furnishing and installing electric cable for traffic signals of the type, size and number of conductors as specified on the plans. The cable must 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 acceptable lubricants may be used. All cables installed in conduit will be from the power source to the traffic signal controller, from the traffic controller to the City traffic signal junction box, or from junction box to junction box. Cables that terminate in a traffic signal controller or traffic signal junction box must extend two inches (2") above the bottom of the box, or cabinet, and the following procedure 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.

**Slack Cable:** The length of cable slack must be provided in accordance with the following schedule:

<u>Location</u>	<u>Length of Slack Cable (feet)</u>
Base of Controller Post	1
Detector, Junction Box	1
Base of Traffic Signal Post or Traffic Signal Pole	2
City Handhole	6
City Manhole	12
ComEd 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 are considered included in the cost of this pay item.

No cable splices will be allowed for traffic signal cable, with the exception of 7 conductor interconnect cable. These splices will be indicated on the plans.



**Method of Measurement:** The length of measurement of ELECTRIC CABLE IN CONDUIT, SIGNAL NO. 14 19C will be the distance horizontally measured between changes in direction, and will include slack cable. 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, SIGNAL NO. 14 19C. This price will be payment in full for furnishing, installing, connecting, splicing, and testing of cable, and will include all labor, materials, equipment, tools, and incidentals necessary to complete the work, as specified herein, and as shown on the plans.

MATERIAL SPECIFICATION

1537

September 1, 2006

**ITEM 179      \*\*\*\*\*      TEMPORARY TRAFFIC SIGNAL INSTALLATION**

**Description:** This work will consist of furnishing, installing and removing temporary aerial wiring on existing poles or poles mounted on concrete blocks to maintain continuous traffic signal operation while other intersection work is completed and installing signal timings as directed by CDOT/OEMC or Engineer for temporary condition. This work will also include any required temporary traffic signal equipment, temporary relocation and wiring of traffic signal heads or pedestrian signal heads to adjacent poles to maintain visibility and continuous traffic signal operation during construction on intersections along Lake Street.

**Material and Installation:** The contractor must ensure at least two primary signal heads are visible at all times. The contractor must submit temporary traffic signal head location plan to the Engineer for approval before installing. The Contractor must select an aerial wiring scheme based on the specific requirements of each intersection. Contractor must ensure temporary cable connection is in place before intercepting existing conduits. The Contractor may use multi conductor self-supporting cable or cable requiring messenger wire of sufficient voltage and rating to handle the intersection electrical requirements as approved by the Commissioner and the CDOT Division of Electrical Operations. The Contractor must submit a sketch of the proposed wiring scheme and signal timing plan (wire location, type of cable) and signal timing plans to the Commissioner and the CDOT Division of Electrical Operations and CDOT traffic for approval prior to installation.

Any cables or wires utilized for this work below an elevation of 10 feet above the sidewalk must be protected from access and view by split duct or PVC conduit and must be properly secured to existing pole(s) through banding or other method as approved by the Commissioner and the CDOT Division of Electrical Operations. All split ducts must be securely tied with cable ties or other approved method at intervals of not more than three (3) feet. Drilling or notching of poles, cabinets or junction boxes is expressly prohibited. When directed by the Commissioner, Contractor must provide a temporary base for the existing traffic signal controller during the temporary traffic signal installation. The temporary location of the traffic signal controller must be approved by the Commissioner. Entry into poles at the pole tops is permissible. Entry into junction boxes by removing the top cover plate is also permissible provided that the plate and all screws shall be re installed at the end of the project. Entry of poles through the pole cap, removal and replacement of the top plate of the junction box, installation of split duct or PVC conduit below 10 feet will all be incidental to TEMPORARY TRAFFIC SIGNAL INSTALLATION.

Temporary wiring or the temporary relocation of traffic signal and pedestrian heads will be connected to the existing controller and cabinet. After intersection operation is transferred to the new signal controller and equipment, the temporary aerial wiring and any relocated traffic or pedestrian signal heads must be removed. Removed temporary wiring will remain the property of the Contractor. Removal of said wiring and any relocated traffic or pedestrian signal heads will be incidental to TEMPORARY TRAFFIC SIGNAL INSTALLATION.

The Contractor must maintain the existing traffic signal system at each intersection in this Contract. The maintenance must commence at the time during construction, when the Contractor in the course of his Work begins construction at the intersection. Maintenance must continue in force until the expiration of the time allotted for the project, or until the new signals are accepted by the sponsoring agency, whichever comes first. If signal installation is not completed and accepted within time allotted for the project, signals must be maintained by the Contractor at no additional cost to the sponsoring agency. A properly operating traffic signal system must be maintained by the Contractor at each intersection in the Contract until such date as the new traffic signal system will be accepted for operation and maintenance by the

sponsoring agency at the direction of the Commissioner. Maintaining existing traffic signal system shall be incidental to TEMPORARY TRAFFIC SIGNAL INSTALLATION and shall not be paid for separately.

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

**General Requirements:** Perform work in accordance with Division 800, Sections 801, 850, 890, and 1086 of the Standard Specifications, CDOT Division of Electrical Operations Standards and the City of Chicago Electrical Code, except as herein modified.

**Maintenance Procedure:** The Contractor must perform the following maintenance program.

Patrol and inspect the signal installation at least once each week for proper alignment of signal heads, lamp outages, and general operation of the traffic signals.

Provide immediate corrective action to replace burned out lamps or damaged sockets with new lamps or sockets of approved qualities. At the time of replacement, the reflector and lens must be cleaned.

Respond to emergency calls within two hours after notification and provide immediate corrective action. The Contractor must maintain in stock a sufficient amount of material and equipment to provide temporary and permanent repairs. Any damage to the signal installation from any cause whatsoever must be repaired or replaced by the Contractor at his own expense. The Contractor may institute action to recover damages from a responsible third party.

The Contractor must install STOP signs (Standard No. R1-1-3636) on all approaches to the intersection as a temporary means of regulating traffic during the time of repair.

The Contractor must provide the Commissioner the names and telephone numbers of two men who will be available 24 hours a day, 7 days a week, to perform any necessary work on the signal installation.

If at any time, the Contractor fails to perform any Work deemed necessary by the Commissioner to keep the traffic signals in proper operating condition, or if the Commissioner finds it impossible to contact the designated men to perform any Work, the Department reserves the right to have other Electrical Contractors perform the needed Work. The cost of such Work will be deducted from the amount due the Contractor.

**Method of Measurement:** Temporary traffic signal and timing installation that is installed and removed will be measured per each intersection. Weekly maintenance for temporary traffic and permanent signal installations will not be measured for payment. Maintenance of Traffic signal is included in this item and will not be measured separately. Each intersection installation will be measured for payment as one unit.

**Basis of Payment:** This work will be paid for at the Contract Unit Price per each TEMPORARY TRAFFIC SIGNAL INSTALLATION, which price will be payment in full for all materials, equipment, and labor necessary to install temporary traffic signals at locations where existing traffic signal equipment must be relocated or removed to install proposed equipment. This price shall include maintaining the same until new signals are in place. The price also includes relocating the existing traffic signal controller to its temporary location, and installation and removal of any required temporary traffic signal equipment.

No weekly maintenance will be paid for temporary traffic signal installations. Payment will be made according to Article 890.04; Sixty percent of the bid unit price will be paid following approval of each installation. The remaining forty percent will be paid following removal of each installation.

**ITEM 180       \*\*\*\*\*       REMOVE EXISTING TRAFFIC SIGNAL EQUIPMENT**

**Description:** This work consists of removing all 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, service equipment for traffic signals and all associated equipment and cable.

Existing cable lengths indicated on plans are for reference use only. Actual cable removal lengths shall be determined in the field or as directed by the Engineer. No extra payment shall be made if cable length is determined to be more than shown on plans.

The traffic signal items, except for traffic signal cable, are to remain the property of the City of Chicago. The Contractor must deliver the obsolete traffic signal equipment to the City of Chicago Yard at 4101 South Cicero Avenue, Chicago, Illinois. Twenty four hour advance notice is necessary before delivery. The traffic signal cable must be removed and become the property of the Contractor and must be disposed of by him, outside the right-of-way, at his sole expense.

The Contractor must provide three (3) copies of a list of equipment that is to remain the property of the City, including model and serial numbers where applicable. He must also provide a copy of the contract plan, or special provisions, showing the quantities and type of equipment. The Contractor will be responsible for the condition of the traffic control equipment from the time of removal until its acceptance by a receipt drawn by the City indicating that the items have been returned.

**METHOD OF MEASUREMENT:** REMOVE EXISTING TRAFFIC SIGNAL EQUIPMENT will be measured as one unit per each signalized intersection. The breaking down of foundations and manholes will not be considered part of this item.

**BASIS OF PAYMENT:** This work will be paid for as REMOVE EXISTING TRAFFIC SIGNAL EQUIPMENT per each signalized intersection. 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 price.

**ITEM 181       \*\*\*\*\*       HARNESS CABLE, #16, 8/C**

**Description:** This item consists of furnishing and installing cable in traffic signal poles to connect traffic signals or illuminated signs to a junction box on the pole.

**Materials:** 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 must be provided so as not to unduly strain the cable during installation, and to provide sufficient cable for easy termination.

**Method of Measurement:** HARNESS CABLE, #16, 8/C will be measured per lineal foot of cable installed. Cable terminations will be considered included in 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.

MATERIAL SPECIFICATION  
1475

September 1, 2006



All conduit entrances into the cabinet must be sealed with a pliable waterproof material to restrict moisture entrance into the cabinet.

Bureau of Electricity (BOE) and Office of Emergency Management and Communications (OEMC) personnel must be present during the cutover to the new control equipment. If a railroad interconnect is part of the signal project, a representative from the Illinois Commerce Commission must be invited to be present for the cutover.

**Method of Measurement:** The measurement of ATC CONTROLLER, TRAFFIC, 16 LOAD BAY IN P CABINET, UPS will be based on each traffic signal controller installed complete.

**Basis of Payment:** This work will be paid for at the contract unit price each for ATC CONTROLLER, TRAFFIC, 16 LOAD BAY IN P CABINET, **UPS** which price will be payment in full for furnishing and installing the controller complete and operational, with all wiring and connections as specified.

MATERIAL SPECIFICATION  
1560

July 5, 2009



**ITEM 183      \*\*\*\*\*      CONTROLLER, STREET LIGHTING, BASE-MOUNTED, 1-  
PHASE, 200 AMP**

**Description:** This work consists 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 voltage specified must be equated to the service capability of the ComEd at the given location and the number of circuits to be serviced must be 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 886 (1-phase, 200amp).

The circuit breakers, single-pole, or two-pole must meet the requirements of Material Specification 1428. The mechanically held, remote control contactor, must be as indicated on the referenced drawings.

**Installation:** The controller must be wired as shown on Drawing 862. The drawing corresponding to the desired controller must be indicated on the plans for a change in ampere capacity of service voltage supply. 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 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 880, 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 must 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 must 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.

**Method of Measurement:** The measurement will be based upon each CONTROLLER, STREET LIGHTING, BASE-MOUNTED, 1-PHASE, 200 AMP installed.

**Basis of Payment:** This work will be charged for at the contract unit price each for a CONTROLLER, STREET LIGHTING, BASE-MOUNTED, 1-PHASE, 200 AMP and will be payment in full for furnishing and installing the controller complete in place.

LAKE STREET RECONSTRUCTION  
DAMEN AVENUE TO ASHLAND AVENUE  
CDOT PROJECT NO.: B-4-118

AUGUST 2017

MATERIAL SPECIFICATION  
1428

DRAWING  
736 785 862  
880 886.

April 3, 2009

**ITEM 184      \*\*\*\*\*      LOOP POLE AND BASE, 10 FOOT**

**Description:** This item consists of furnishing and installing a historic light pole and base of the dimension specified, at the locations shown on the plans, or as directed by the Engineer.

**Materials:** The ten foot pole and base must meet the requirements of Material Specifications 1487 and 1488. The ten foot pole must have the appearance as that shown on Standard Drawing 911.

**Installation:** Installation must be according to 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 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 to 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 911. The base doors must be securely fastened to the pole base. One door must be aligned with the pole handhole when the base is properly installed.

The contractor must utilize non-abrasive slinging materials and must 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 must 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:** LOOP POLE AND BASE, 10 FOOT will be measured per each unit installed and will include all labor and material necessary to install the pole and base on the foundation, and must include the handhole door, as well as the base doors, and all necessary hardware. This item will not include the ornamental twin arm or the luminaire.

**Basis of Payment:** This item will be paid for at the contract unit price each for LOOP POLE AND BASE, 10 FOOT. Payment will be in full for furnishing and installing the pole and base in place.

MATERIAL  
1487  
1488

DRAWINGS  
911

May 15, 2001.

**ITEM 185      \*\*\*\*\*      LOOP POLE TWIN ARM ASSEMBLY**

**Description:** This item consists of furnishing and installing an ornamental twin arm onto a Loop historic style pole. The arm must mount onto the tenon of the pole. The arm itself must have two tenons for mounting two luminaires. The arm must be placed as shown on the plans, or as directed by the Engineer.

**Materials:** The arm must meet the requirements of Material Specification 1489. The arm must have the appearance as that shown on Standard Drawing 911.

**Installation:** Installation must be according to Sections 801 and 830 of the Standard Specifications. The arm must be attached to the pole tenon with stainless steel set screws and orientated perpendicular to the curb-line, as directed by the Engineer.

**Method of Measurement:** LOOP POLE TWIN ARM ASSEMBLY will be measured per each unit installed and will include all labor and material necessary to install the arm on the pole.

**Basis of Payment:** This item will be paid for at the contract unit price each for LOOP POLE TWIN ARM ASSEMBLY, which payment will be in full for furnishing and installing the arm in place.

MATERIAL  
1489

DRAWINGS  
911

May 15, 2001

**ITEM 186       \*\*\*\*\*       LUMINAIRE, LED ORNAMENTAL ACORN**

**Description:** This item will consist of furnishing and installing an ornamental acorn luminaire, complete with internal electronic ballast, and an LED lamp of the proper wattage and input voltage, mounted to a post top attachment on a street light pole, and connecting the unit to an underground cable distribution system at the location shown on the plans, or as directed by the Engineer.

**Materials:** The luminaire shall meet the appropriate material specification for the lamp wattage and type of distribution specified. This item shall meet Material Specification 1586. Luminaires to be black, or as specified by Engineer. All bolts, washers, and nuts must be stainless steel. All material will be subject to approval by the engineer. The ornamental luminaire must have the general appearance of Standard Drawing 912.

**Material Acceptance:** The Contractor shall provide a Manufacturer's written certification that the materials comply with these specifications.

**Installation:** The luminaire shall be securely installed on the mast arm. The vertical axis of the luminaire shall be in a vertical plane, and the longitudinal axis shall be leveled as specified in shop drawings supplied by the manufacturer to produce the desired distribution pattern with the lamp socket secured in the required position for that distribution. Ornamental acorns shall be mounted on the pole top using a bracket supplied with this item. The bracket will be for one or two fixtures, as specified, or as directed by the Engineer. Ornamental acorns shall be aimed for proper light distribution.

A cartridge type fuse, type KTK, rated at 10 amperes shall be installed in each of the fuse holders. The primary wiring to the ballast shall consist of 2 1/C No. 12 AWG wires with 150 degree C. irradiated polyethylen, insulation connected to the terminal board "line" terminals. They shall extend through the mast arm raceway and down the inside of the pole to the pole base where they shall be spliced to the underground feeder cables. Sufficient wire shall be supplied to extend the wires outside of the pole through the access handhole to permit splicing work to be performed outside the pole.

All splice methods shall be approved by the Engineer before implemented. All splices, tapes and grounding connections shall be inspected by the Commissioner's authorized representative before wires are permanently trained in the light pole.

Current, insulation resistance, and voltage readings shall be taken and tabulated by the Contractor for each circuit. These readings are to be witnessed by the Commissioner's authorized representative. Any indication of grounds, open, or crossed conductors shall be thoroughly investigated and remedied before acceptance of the installation. Line voltage shall be taken at any in line fused location, within the pole designated by the Commissioner's authorized representative. Locations and voltage shall be tabulated as directed. Three (3) copies of the tabulated voltage insulation resistance, and current readings shall be submitted to the Commissioner's authorized representative. Maximum voltage drop shall not exceed 10% of nominal source voltage. The insulation resistance shall not be less than 2 Megohms, when tested to ground with 500 volts A.C.

The Contractor shall submit the manufacturer's certified test reports on all materials used on this project. Any material deemed defective shall be removed and disposed of by the Contractor at his sole cost.

After the lighting installation has been completed and satisfactory current and voltage readings recorded, a field test shall be made to insure that all lighting and control equipment are in proper operating condition. This field test shall be witnessed by the Commissioner.

The Contractor shall furnish special test devices, tools and miscellaneous items that shall be required for the testing of cables and control equipment, all as herein specified.

**Method of Measurement:** LUMINAIRE, LED ORNAMENTAL ACORN will be measured per each unit installed, complete. All wiring to the underground feeder cable, including splices, will be included in this measurement.

**Basis of Payment:** This work will be paid for at the contract unit price each for a LUMINAIRE, LED ORNAMENTAL ACORN, and mounting method, which will be payment in full for furnishing, installing, connecting and testing the unit complete in place.

MATERIAL SPECIFICATION  
1586

**ITEM 187      \*\*\*\*\*      BREAKDOWN EXISTING HANDHOLE**

**Description:** Work under these items includes breaking down an existing electrical handhole or manhole and filling in the affected area to grade.

**Construction:** This work consists 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 resident engineer, the frame and/or cover must be delivered to the Bureau of Electricity at a location identified by the resident engineer. Any debris, including the frame and cover must be disposed of off-sight in an approved manner. The contractor must pay for all disposal fees.

**Method of Measurement:** BREAKDOWN ELECTRICAL HANDHOLE will be based upon each handhole or manhole 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 ELECTRICAL HANDHOLE, 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.

May 22, 2001

**ITEM 188      \*\*\*\*\*      REMOVE EXISTING CONCRETE FOUNDATION**

**Description:** This work consists of breaking down an existing concrete foundation and filling in the affected area to grade at the location shown on the plans or as directed by the Commissioner.

**General Requirements:** This work must be performed in accordance with Sections 800, 803, and 895 of the Standard Specifications for Road and Bridge Construction, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

**Construction Requirements:** The work consists of removing a concrete foundation for a street lighting pole or traffic signal controller completely if possible, or to a level three (3) feet below grade, disposing of the debris off-site 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 top six (6) inches must be properly restored with an approved soil mixture. 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.

**Method of Measurement:** The measurement of REMOVE EXISTING CONCRETE FOUNDATION will be based upon each foundation removed which will also include proper disposal and backfill.

**Basis of Payment:** This item will be paid for at the contract unit price each for REMOVE EXISTING CONCRETE FOUNDATION. Such price will be considered payment in full for all labor and material necessary to perform the work as described above. No additional payment will be made for backfill or disposal of debris.



**ITEM 189       \*\*\*\*\*       REMOVE EXISTING STREET LIGHTING EQUIPMENT**

**Description:** This work consists of removing all obsolete street lighting equipment and associated electric cable at various locations shown on the plans.

Street lighting poles (anchor base or embedded), base ballast housing, mast arms, luminaires, controllers and secondary racks are to be removed and remain the property of the City of Chicago. Embedded poles must be removed by means other than burning where possible. If required, embedded poles must be burned off at a minimum of eighteen inches below ground level.

All equipment, with the exception of the cable, will remain the property of the City of Chicago. The Contractor must deliver the obsolete street lighting equipment to the City of Chicago Yard at 2451 South Ashland Avenue, Chicago, Illinois. Twenty four hours advance notice is necessary before delivery. Street lighting cable must be removed as indicated on the plans, and become the property of the Contractor to 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 street lighting equipment from the time of removal until the acceptance of a receipt drawn by the City indicating that the items have been returned in good condition.

**Method of Measurement:** REMOVE EXISTING STREET LIGHTING EQUIPMENT will be measured as a lump sum.

**Basis of Payment:** This work will be paid for at the contract lump sum for REMOVE EXISTING STREET LIGHTING EQUIPMENT of the type specified at the various locations shown on the plans. 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 190 \*\*\*\*\* MAINTAIN EXISTING LIGHTING SYSTEM**

**Description:** This work will consist of maintaining existing street lighting that has been designated to remain in operation during construction of the new lighting system, furnishing all labor, equipment, and materials for maintaining existing street lighting system until the proposed new equipment is installed, energized, tested, and accepted for operation by the Commissioner.

**Maintenance Procedures:** Before taking over maintenance of the existing lighting system, the Contractor shall arrange to make an inspection with the Engineer to determine if any corrective action is required and to mutually agree on a date for transferring maintenance. The Contractor should normally begin maintaining the existing lighting as soon as the Contractor begins any work at the site.

The Contractor shall be responsible for maintaining the lighting system in proper operating condition. Maintenance procedures shall be as outlined in Article 801.11 of the Standard Specifications.

The work must include any necessary temporary devices to maintain existing illumination. The location and protection of devices necessary to comply with these requirements must be subject to the approval of the Commissioner. The Commissioner 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 must be furnished, installed, terminated, and maintained in service until the proposed lighting equipment is installed, tested and accepted for operation by the Commissioner.

The contractor must protect, maintain, and reconfigure as needed, aerial cable providing service to CTA structure mounted lighting west of Ashland Avenue outside the project limits. The contractor must provide temporary cable if necessary to maintain CTA structure mounted lighting during construction.

**Materials:** Materials must be according to the following Division of Electrical Operations (DEO) Specifications and Articles of Standard Specifications Section 1000 – Materials:

Item	Requirement
(a) Cable Splicing and Termination 1066.06	Standard Specifications Article
(b) Fuse holders and Fuses 1065.01	Standard Specifications Article
(c) Pole Wire 1066.09	Standard Specifications Article
(d) Lamps 1067.06	Standard Specifications Article
(e) Aerial Cable Assembly 1066.04	Standard Specifications Article
(f) Thermal Magnetic Circuit Breaker	DEO Specification 1428
(g) Metal Light Poles 1069.01	Standard Specifications Article
(h) Luminaires 1067.01	Standard Specifications Article

**General Requirements:** General requirements must be in accordance with Section 801 of the Standard Specifications, and in accordance with DEO Standards and the City of Chicago Electrical Code, except as herein modified.

The Contractor must 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 must maintain the existing lighting equipment located within the project limits as it then exists. The contractor must also maintain any street lighting equipment outside of the project limits but connected to a controller situated within the project limits. The contractor must 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 must 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 must 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.

The Contractor must take over maintenance of all the equipment supplied with electric power from all street lighting controllers regardless of location which control lighting units located on Lake Street, associated streets, crosswalks, and underpasses within or outside of the project limits.

**Installation Requirements for Temporary Lighting Units:** The Contractor must 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 must include pole, mast arm, 310 watt luminaire, and temporary wiring connections. The Contractor must furnish and install temporary lighting units and all associated electrical equipment to ensure compliance with the applicable codes, standards, and Specifications.

The Contractor must coordinate temporary lighting with the sequence of construction and maintenance of traffic for this Project.

The wiring on the pole must consist of aerial electric cables and waterproof splices at each light pole.

All equipment furnished must be functional and new in appearance, and must be maintained. The Contractor must own all the temporary lighting equipment furnished and installed.

The Contractor must disconnect and remove temporary lighting and all associated electrical equipment upon energizing and acceptance of the permanent lighting system.

**Temporary Wiring:** The Contractor must furnish and install aerial electric cable, including messenger wire, in accordance with Article 1066.04 of the Standard Specifications. The conductor size must be Number 6 AWG minimum. The messenger wire must be steel and of adequate size to support the cables from structure to structure under normal and adverse weather conditions.

The electric cables must be secured to the steel messenger wire with binding strips continuous throughout each span of cable and must 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 must be similar in type, size and finish.

Temporary lighting poles may be used steel poles that comply with DEO Specification Number 1447 if already owned by the Contractor and in Stock.

The Contractor must 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 Commissioner.

**Temporary Luminaire:** Each luminaire must be a high pressured sodium vapor, Crime Fighter type. Each luminaire must be mast arm or bracket arm mounted on the top of the pole. Each luminaire must be provided with a leveling surface and a leveling device and must be capable of being tilted by plus or minus 30 degrees and rotated to any degree with respect to the supporting bracket. Each luminaire must have a pipe arm barrier to limit the amount of inflection.

**Installation:** Location of cables and fixtures for temporary lighting must be adjusted and supported to accommodate field conditions encountered, including any potential interferences with other construction or equipment to be installed.

The Contractor must determine the exact route and location of each temporary lighting fixture and associated wiring, prior to installation.

Temporary lighting must be installed to permit removal (without damage to other parts) of parts requiring periodic replacement or maintenance.

Temporary wiring/lighting must be removed immediately upon acceptance of permanent lighting.

**Penalty for Non-Compliance:** The Contractor will be subject of \$500.00 per incident, per day, to be deducted from next pay estimate due Contractor, for each occurrence when the Commissioner determines that Contractor or his Subcontractor is not in full compliance with this Section of the Specification.

**Penalty for Failure to Respond:** The Contractor is required to respond within ½ hour to any request from the Commissioner for repair or replacement of any broken, defective and/or missing parts as specified under this section, "Response" is interpreted to mean on the job, preparing to make repairs. Failure by Contractor to so respond must be grounds for a penalty of \$500.00 for each and every occurrence, to be deducted from next pay estimate due Contractor.

**Preconstruction Inspection:** Before performing any excavation, removal, or installation work (electrical or otherwise) at the site, the Contractor must initiate a request for preconstruction inspection, to be held in the presence of the Commissioner and a representative of the party or parties responsible for maintenance of any of any lighting and/or traffic control systems which may be affected by the work. The request for the maintenance preconstruction must be made

no less than seven (7) calendar days prior to the desired inspection date. The maintenance preconstruction inspection must:

- 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.

**Reimbursement:** If the Contractor utilizes any lighting equipment owned by the City or uses existing Com Ed service, the Contractor must compensate the City for such usage.

**Method of Measurement:** MAINTAIN EXISTING 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 MAINTAIN EXISTING LIGHTING SYSTEM, which will be payment in full for maintaining the lighting system from the mutually agreed maintenance transfer date until the de-energization of the existing lighting system, which is to occur when the proposed new equipment is installed, energized, tested, and accepted for operation by the Commissioner, furnishing, installing, and removing all temporary lighting units, aerial cable and ancillary equipment required to maintain the existing lighting system as described herein. If for any reason the Contractor fails to properly maintain the lighting installation, leading to and requiring a response from City maintenance forces, the cost of such a response will be charged to the Contractor.

**ITEM 191       \*\*\*\*\*       COMMUNICATIONS CABLE RELOCATION**

**Description:** This work consists of coordinating with and providing payment to Adesta for the relocation of fiber optic communication lines attached to the existing transverse girders of the CTA Lake Street structure.

**General Requirements:** It is the Contractor's responsibility to contact Adesta to coordinate the relocation of the cables. The Contractor is to contact Mr. Chris Roberts at (630) 739-0546 (office phone) or (815) 405-1358 (cell phone) a minimum of four (4) weeks prior to the relocation.

**Method of Payment:** The contractor will be reimbursed to the exact amount of money as billed by Adesta for relocating the fiber optic cables plus markup of 5% on the first \$10,000 and 1% of any amount over \$10,000 of the total approved cost of the work. No separate payment will be made for coordination.

No markups will be allowed to any subcontractor.

Following the approval of the Adesta invoices by the Department, the Contractor must pay all monies to Adesta and must submit to the Department certified and notarized evidence of the amount of payments.

**Method of Measurement:** COMMUNICATIONS CABLE RELOCATION will be measured as an allowance.

**Basis of Payment:** COMMUNICATIONS CABLE RELOCATION will be paid on an allowance basis, based on submitted/audited paid invoices from Adesta, plus mark up. The contractor will not be due the balance any of the monies allocated for this item remaining after final audit or the value of the deposit.

The estimated unit price and total cost have been included in the Schedule of Prices.

<b>ITEM 192</b>	<b>*****</b>	<b><u>PERENNIAL, HEMEROCALLIS 'HAPPY RETURNS' (HAPPY RETURNS DAYLILY, 1-GALLON)</u></b>
<b>ITEM 193</b>	<b>*****</b>	<b><u>PERENNIAL, HEMEROCALLIS 'LITTLE BUSINESS' LITTLE BUSINESS DAYLILY, 1-GALLON</u></b>
<b>ITEM 194</b>	<b>*****</b>	<b><u>PERENNIAL, HEMEROCALLIS 'ROSY RETURNS' (ROSY RETURNS DAYLILY, 1-GALLON)</u></b>

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 container shrubs, perennials, grasses, ground covers and bulbs. A two (2) year period of establishment on all trees and a one (1) year period of establishment on all other plant material is included under these pay items.

**Materials:** 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. Trees and Shrubs-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.
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 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 tree or shrub to indicate common and botanical name.
  3. Deciduous shrubs  
Container grown only
  4. 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.
  - 3. Tree wrap tape: Nurseryman's standard protective 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. 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. RFIPM's for fall planting will not be accepted after September 1 unless otherwise approved by CDOT Engineering Landscape Section.

- B. Plant inspections will occur through submission of three (3) digital photographs per species which includes but is not limited to the following:

- 2) Photo of a representative plant next to a ruler
- 3) Photo the root system of said plant
- 4) 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.

Guidelines:

- A. Planting season: (As herein specified or as directed by the Commissioner)

Herbaceous Plants:

Where Irrigated:	April 15 to October 15
Non-Irrigated:	April 15 to June 15
	September 15 to October 15

Woody Plants:

Where Irrigated:	March 15 to November 30
Non-Irrigated:	March 15 to June 30
	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.

**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 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, staking and guying of trees 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: 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.

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 and 10 gallons for trees. 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 from trees. 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 Section 253.14 of the Standard Specifications except that the period of establishment will be two (2) years for trees and one (1) year for all other plant material.

**Method of Measurement:** PERENNIAL, HEMEROCALLIS 'HAPPY RETURNS' (HAPPY RETURNS DAYLILY), 1-GALLON; PERENNIAL, HEMEROCALLIS 'LITTLE BUSINESS' (LITTLE BUSINESS DAYLILY), 1-GALLON; and PERENNIAL, HEMEROCALLIS 'ROSY RETURNS' (ROSY RETURNS DAYLILY), 1-GALLON 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, HEMEROCALLIS 'HAPPY RETURNS' (HAPPY RETURNS DAYLILY), 1-GALLON; PERENNIAL, HEMEROCALLIS 'LITTLE BUSINESS' (LITTLE

BUSINESS DAYLILY), 1-GALLON; and PERENNIAL, HEMEROCALLIS 'ROSY RETURNS' (ROSY RETURNS DAYLILY), 1-GALLON 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.

APPENDIX A  
CDOT DIVISION OF ELECTRICAL OPERATIONS  
MATERIAL SPECIFICATIONS

## APPENDIX A

### CITY OF CHICAGO DEPARTMENT OF TRANSPORTATION DIVISION OF ELECTRICAL OPERATIONS

#### SUMMARY

This Appendix includes copies of technical documents which are made available to the Contractor as a convenience for informational purposes.

<i>Document</i>	<i>Pages</i>
<b>SPECIFICATION NO. 1351, WIRE: SINGLE CONDUCTOR NO. 12 COPPER WITH CROSS LINKED POLYETHYLENE INSULATION</b> Dated June 7, 2006.....	4
<b>SPECIFICATION NO. 1375, BASE: BALLAST HOUSING, NO. 7 U.S. STANDARD GAUGE STEEL</b> Dated March 31, 1977 .....	3
<b>SPECIFICATION NO. 1385, PEDESTAL WITH BASE: ALUMINUM FOR TRAFFIC SIGNALS</b> Dated July 31, 2006 .....	2
<b>SPECIFICATION NO. 1407, POLE MOUNTED CAST ALUMINUM JUNCTION BOX FOR TRAFFIC SIGNALS</b> Dated June 27, 2006.....	3
<b>SPECIFICATION NO. 1428, THERMAL MAGNETIC CIRCUIT BREAKER</b> Dated September 11, 1989.....	4
<b>SPECIFICATION NO. 1447, POLE: ANCHOR BASE, 3 AND 7 GAUGE, TAPERED TUBULAR STEEL, WITH HANDHOLE ENTRY</b> Dated March 20, 2007 .....	10
<b>SPECIFICATION NO. 1450, MAST ARMS: 4-, 8-, 12-, AND 15-FOOT: STEEL</b> Dated April 20, 2007 .....	6
<b>SPECIFICATION NO. 1457, CABLE: SERVICE ENTRANCE, THREE INSULATED CONDUCTORS IN ONE OVERALL JACKET, 600 VOLT</b> Dated August 3, 2006 .....	6
<b>SPECIFICATION NO. 1458, ELECTRICAL MANHOLE FRAMES AND COVERS 24 INCH AND 30 INCH DIAMETER</b> Dated July 10, 2006 .....	2

**CITY OF CHICAGO**  
**DEPARTMENT OF TRANSPORTATION**  
**DIVISION OF ELECTRICAL OPERATIONS**

<i>Document</i>	<i>Pages</i>
<b>SPECIFICATION NO. 1462, RIGID STEEL CONDUIT (HOT DIPPED GALVANIZED)</b> Dated August 3, 2006 .....	7
<b>SPECIFICATION NO. 1464, FUSES FOR STREET LIGHTING</b> Dated November 24, 1992 .....	1
<b>SPECIFICATION NO. 1465, GROUND RODS</b> Dated July 12, 2006 .....	2
<b>SPECIFICATION NO. 1467, ROD: ANCHOR, STEEL, WITH HARDWARE</b> Dated May 12, 1993.....	2
<b>SPECIFICATION NO. 1474, CABLE: TRAFFIC SIGNAL CABLE MULTIPLE CONDUCTOR, COPPER WIRE, 600 VOLT CROSS-LINKED POLYETHYLENE INSULATION LOW SMOKE ZERO HALOGEN JACKET</b> Dated May 26, 2005.....	6
<b>SPECIFICATION NO. 1475, CORD: TRAFFIC SIGNAL, EIGHT CONDUCTOR NO. 16 AWG, 600 VOLT</b> Dated September 26, 2006.....	5
<b>SPECIFICATION NO. 1487, POLE: ORNAMENTAL, LOOP STYLE, 10 FOOT 15” BOLT CIRCLE; STEEL 7 GAUGE</b> Dated October 31, 1997.....	6
<b>SPECIFICATION NO. 1488, PEDESTAL BASE: ORNAMENTAL, FOR 10 FOOT LOOP STYLE POLE</b> Dated July 15, 2002 .....	8
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**CITY OF CHICAGO**  
**DEPARTMENT OF TRANSPORTATION**  
**DIVISION OF ELECTRICAL OPERATIONS**

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**ELECTRICAL SPECIFICATION 1351  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
REVISED JUNE 7, 2006**

**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 referenced specifications of the American Society for Testing and Materials (ASTM), the National Electric Code (NEC), Underwriters Laboratories (UL), the Insulated Cable Engineers Association (ICEA), and the National Electrical Manufacturers Association (NEMA), in which the most recently published revisions will govern.
- (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 a coated 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 90° C in wet or dry locations.
- (b) **Sealing.** Both ends of each length of cable must be thoroughly sealed to prevent the entrance of moisture and other foreign matter.
- (c) **Color.** All cables must use a carbon black pigmented cross linked polyethylene compound. Any other color must be an approved, permanent type coating applied to the carbon black insulation.
- (d) **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, 90°, RHW-2 or USE-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.

**CONDUCTOR**

4. (a) **Material.** Conductor shall be Number 12 AWG consisting of seven (7) strands of coated, annealed, copper wires (.0305 inch diameter) per ASTM-8, Class B.
- (b) **Resistivity.** Conductor shall conform to the requirements of ASTM B-33.
- (c) **Coating.** Conductor shall be tin coated in accordance with 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%).

(c) Physical Properties

Initial Values:

Tensile strength, minimum psi        2000

Elongation at rupture, minimum %    250

**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

After Aging:

1. After 168 hours in oxygen bomb at a pressure of 80 psi and a temperature at  $127^{\circ} \pm 1^{\circ} \text{C}$  :

Tensile strength, minimum % of initial value        75

Elongation at rupture, minimum % of initial value   75

2. After 168 hours in an air oven at  $121^{\circ} \pm 1^{\circ} \text{C}$  :

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  $150^{\circ} \text{C}$  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  $75^{\circ} \pm 1^{\circ}$  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  $70^{\circ}$  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.
- (g) Reports Required. Test reports must include the physical properties, both initial and after aging, the accelerated water absorption characteristics, and the electrical characteristics.

## **PACKING**

7. 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.

**SPECIFICATION 1375  
BUREAU OF ELECTRICITY  
DEPARTMENT OF STREETS AND SANITATION  
CITY OF CHICAGO  
MARCH 31, 1977**

**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 must 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 Streets and Sanitation. 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 A-606 Type 4 for the sides and door and to ASTM A-36 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 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 must 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 must 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 Penetrol must 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 Federal Specification TT-P-636B.

## **TESTING**

- 4. (a) Chemical Composition. Certified reports from the steel manufacturer must be furnished to the city upon request of the Purchasing Agent.

- (b) Test Specimens. Must conform to the requirements of ASTM Specifications A-36 and A-606 Type 4.
- (c) Strength Tests. One test specimen of the metal in each order of 50 base assemblies or less must 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 must 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 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.
- (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.

### **INSPECTION**

- 6. An inspector representing the City must have free entry at all times, while the work on the contract is being performed, to all parts of the manufacture of these base assemblies. The manufacturer must afford the inspector, without charge, all reasonable facilities to satisfy him that the base assemblies are being furnished in accord with this specification. The final inspection must be made at the facilities of the manufacturer.

THIS SPECIFICATION MUST NOT BE ALTERED



**SPECIFICATION 1385  
DEPARTMENT OF STREETS AND SANITATION  
BUREAU OF ELECTRICITY  
CITY OF CHICAGO  
REVISED JULY 31, 2006**

**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 must conform to the requirements herein stated, 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, and to the requirements of the American Welding Society.
- (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 Streets and Sanitation. 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) days upon receipt of a request from the Chief Procurement Officer.

**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 of ASTM B26 with a minimum wall 9/32 inch thick. The handhole opening must have a recessed lip along the entire length of both sides and the bottom such that with the door in place the exterior surface of the door is flush with the exterior surface of the base. The door must have the same curvature as the base. The door must be locked in place by means of two fingers located on its top edge which bear against the inside surface of the base, and a stainless steel Allen head locking screw which fastens to the base. The locking screw must be protected by a C-shaped drip edge protruding approximately 5/8" and concentrically encircling the screw head. The clearance between the inner surface of the drip edge and the outer surface of the screw head must be no greater than 1/8". The drip edge must encircle the screw head by a minimum of 300° with the opening in the drip edge centered at the bottom of the screw head. A continuous pipe stop must be integrally cast along the inside of the base 2.5" below the top edge.
- (c) Pedestal. The pedestal must be aluminum-alloy extruded round tube conforming to the requirements of ASTM-B221, alloy 6063-T6. The aluminum pedestal must be flash anodized in accordance with Aluminum Association designation C22A21 or Alcoa designation 202-R1. Its outside diameter must be 5.563 inches; its wall must be not less than 0.187 inch thick, 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 (2.5) inches 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) Welding. The welds must be made by the inert gas metal welding process. Filler wire must conform to chemical composition requirements of American Welding Society Alloy Number A5.10-69.
- (e) Packing. The pedestal base must be suitably packed or blocked to prevent damage during shipment and handling.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1407  
BUREAU OF ELECTRICITY  
DEPARTMENT OF STREETS AND SANITATION  
CITY OF CHICAGO  
REVISED JUNE 27, 2006**

**POLE MOUNTED CAST ALUMINUM JUNCTION BOX FOR TRAFFIC  
SIGNALS**

---

**SCOPE**

1. This specification states the requirements for pole mounted, cast aluminum junction boxes to be used as enclosures for traffic signal multiple cable terminals.

**GENERAL**

2.
  - (a) Specifications. The junction boxes 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 revisions will govern.
  - (b) Drawing. The drawing mentioned herein is a drawing of the Department of Streets and Sanitation, Bureau of Electricity, 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 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. The box must be delivered to the Bureau of Electricity.
  - (e) Workmanship. All junction boxes must 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 must consist of the body, door with its gasket, flat plate with its gasket, terminal block mounting bracket and bottom gasket with its stainless steel hardware furnished as described below, all completely assembled, painted and ready for installation.
- (b) Body. The body must 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 must be cast as shown in drawing number 954. The door must be hinged at the left with stainless steel hinge pins and must open not less than 180° to permit complete access to the interior of the junction box. Two stainless steel Allen head machine screws, undercut and held captive, must hold the door closed and maintain positive pressure against a sponge neoprene gasket cemented in place completely around the door jamb. The door must be finished and painted prior to cementing the gasket into its groove in the door.
- (d) End Plate. A flat end plate must 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 and be held in place by four (4) stainless steel machine screws.
- (e) Mounting Bracket. A terminal block mounting bracket, as shown on Drawing Number 954, must be furnished and installed in each junction box. The bracket must be cast from ANSI alloy 443.0 per ASTM B26.
- (f) Gaskets. The gasketing between the body and the door must be of sponge neoprene and must be cemented in place after painting of the door. A cork gasket, 1/8 inch thick, must be used between the end plate and the body of the junction box on the top end and held in place by four (4) stainless steel screws. An identical cork gasket and four (4) stainless steel screws must be placed within the box before shipping. This gasket with its screws will be used with the fitting used on the bottom end of the box.
- (g) Hardware. The hinge pins and all screws required for assembly of this junction box must be of stainless steel.
- (h) Painting. The exterior surfaces of the junction box must 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 must be of an approved grade and quality.

- (i) Packing. After the paint is completely dry, and the junction boxes have been assembled, they must 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.

### **INSPECTION**

- 5. An inspector representing the City of Chicago must have free access, at all times while work on these junction boxes is being performed, to all parts of the manufacturer's work which are concerned with their manufacture. The manufacturer must afford the inspector, without charge, all reasonable facilities to satisfy him that the junction boxes are being furnished in accordance with this specification. The final inspection must be made at the point of delivery. Any junction boxes rejected must be removed and disposed of by the Contractor at his sole expense.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1428  
BUREAU OF ELECTRICITY  
DEPARTMENT OF STREETS AND SANITATION  
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) must be delivered to the Engineer of Electricity, Bureau of Electricity, 2451 South Ashland Avenue, Chicago, Illinois 60608.
  - (b) U.L. Approval. Circuit breakers furnished under this specification must 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 must be furnished with each circuit breaker, except as otherwise indicated.
  - (f) Packing. Each circuit breaker must 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.

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 must 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 Streets and Sanitation 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 must 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.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1447  
BUREAU OF ELECTRICITY  
DEPARTMENT OF STREETS AND SANITATION  
CITY OF CHICAGO  
REVISED MARCH 20, 2007**

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 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 revisions will govern.
  - (b) Acceptance. Poles not conforming to this specification will not be accepted.
  - (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, preferably Microstation 95, if so requested by the City.
  - (d) Drawings. The drawings mentioned herein are drawings of the Department of Streets and Sanitation 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 must 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 must 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 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 must 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 must be ground smooth so that it is virtually invisible. There must 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 must have smooth external surfaces free from protuberances, dents, cracks or other imperfections marring their appearance.

- (d) Base. The mast base must 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 must 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 must 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 must enclose the anchor bolts and be secured in an approved manner. 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 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 must have a width as listed in Table "A". Each opening must be sized to have a circumferential slot length equal to 15 degrees 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 must 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 must 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 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 so as 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 machine screws must be stainless steel with hex heads, meeting the requirements of ASTM A193. The screws must 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-eighth (1/8) inch thick. It must 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 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 must 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 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 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 must 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 must 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 must be similar to one shown on Drawing #11420A.
- (b) Material. The top must be aluminum alloy 356-F per ASTM B108. It must 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 must be painted as herein specified.

## **HARDWARE**

6. 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 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 must 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 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 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 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 SSPCS-SP10. Included in this process must be the interior base section of the mast to a minimum height of twelve (12) inches.
- (c) Chemical Pretreatment. The cleaned metal surfaces must then be treated with a hot, pressurized iron phosphate wash and must be dried by convection heat.
- (d) Primer Coat. All exterior surfaces are to be coated with Tnemec 90-97 corrosion-inhibiting zinc-rich aromatic urethane to a minimum dry film thickness of 2.5 mils (.0025"). The aromatic urethane is to consist of a zinc dust content not less than 83% by weight in dried film. The coating must be airless-spray applied and moisture cured.
- (e) Finish Coat. All exterior surfaces are to be subsequently coated with Tnemec Endura-Shield II 1074 aliphatic acrylic polyurethane to a minimum dry film thickness of 3.0 mils (.003"). The coating must be airless-spray applied and cured in 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 five percent (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 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 must be available for testing for maximum deflection and set. The masts must meet the structural requirements of Section 4(k). Unless specifically authorized in writing, all tests must be made at the works of the manufacturer. The tests must be witnessed and certified by an engineer from the Bureau of Electricity. If an engineer from the Bureau is not available, an independent consultant, approved by the Bureau, must witness and certify the tests. There will be no cost to the City for this. 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 must be made upon three (3) masts of the first fifty (50) in every order. An additional one (1) mast must be tested for each additional fifty (50) masts in the order. 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) 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  $\pm 5\%$ . 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.

- (e) The contractor must include in his bid, the cost of travel, food and lodging for one (1) engineer. Travel for 150 miles or greater must utilize a major airline. Lodging accommodations must be equal to those provided at a Holiday Inn. The engineer must be given ten (10) working days notice of travel arrangements.

## **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 must 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 fork lift 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.
- (d) Delivery. All poles will be delivered to the Bureau of Electricity storage yard at 4101 South Cicero Avenue in Chicago, or to another location within the City as indicated on the order. Light pole information must include any recommendations of the manufacturer for storage.

**INSPECTION**

11. An inspector representing the City must have free entry at all times, while the work on the contract is being performed, to all parts of the manufacturer's works which concern the manufacture of poles. The manufacturer must afford the inspector, without charge, all reasonable facilities to satisfy him that the poles are being furnished in accord with these specifications. The final inspection must be made at point of delivery. Any poles rejected as defective must be removed and disposed of by the contractor at his sole cost.

**TABLE A**

POLE	GAUGE	BOLT CIRCLE	ANCHOR ROD	BASE P L A T E	TEST L O A D	M A X. D E F	M A X. S E T	D R A W I N G
7.67"x12.5" x34'6"	3	16.5"	1.5"	1.75"	3200#	22"	2.5"	827
6.17"x11"x 34'6"	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"x 32'6"	3	11.5"	1.25"	1.5"	1500#	33"	2.5"	763
3.95"x8.5"x 32'6"	7	11.5"	1.0"	1.25"	1200#	33"	2.5"	762
3.87"x8.0"x 29'6"	3	10.0"	1.0"	1.5"	1500#	28"	1.0"	657
3.87"x8.0"x 29'6"	7	10.0"	1.0"	1.25"	1200#	28"	1.0"	656
4.15"x8.0"x 27'6"	3	10.0"	1.0"	1.5"	1500#	23"	1.0"	655
4.15"x8.0"x 27'6"	7	10.0"	1.0"	1.25	1200#	23"	1.0"	654
4.20"x7.0"x 20'0"	3	10.0"	1.0"	1.0"	1500#	13"	1.0"	653
3.70"x6.5"x 20'0"	11	10.0"	1.0"	1.0"	800#	14"	1.0"	652

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1450  
BUREAU OF ELECTRICITY  
DEPARTMENT OF STREETS AND SANITATION  
CITY OF CHICAGO  
REVISED APRIL 20, 2007**

**MAST ARMS: 4-, 8-, 12-, AND 15-FOOT: STEEL**

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**SUBJECT**

1. This specification covers the requirements for 4-, 8-, 12-, and 15-foot steel mast arms for supporting street light luminaires.

**GENERAL**

2.
  - (a) Specifications. The mast arms 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. Mast arms not conforming to this specification will not be accepted.
  - (c) Drawings. The drawings mentioned herein are drawings of the Department of Streets and Sanitation. They are integral parts of this specification cooperating to state necessary requirements.
  - (d) Bidders Drawings. Bidders must submit with their bids detailed scale drawings of the mast arms and attachments showing actual dimensions, details, and welds. Shop drawings must be original engineering drawings created by the manufacturer. The drawings must give every dimension necessary to show how the parts will fit each other and be properly held in assembly. These drawings must be submitted in electronic format, preferably Microstation 95, if so requested by the City.
  - (e) Sample. One complete mast arm of each size and of the manufacture intended to be furnished 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 mast arms 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 three 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.

### **DESIGN**

3. (a) 4-Foot Mast Arm. Each 4-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 Drawing Number 661.
- (b) 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 Drawing Number 620.
- (c) 12-Foot Mast Arm. Each 12-foot mast arm must be fabricated from two (2) continuous, single piece, two (2) inch "standard" steel pipes conforming to the requirements of ASTM A53, Table X2. It must conform in detail with the mast arm shown on Drawing Number 839.
- (d) 15-Foot Mast Arm. Each 15-foot mast arm must be fabricated from two (2) continuous, single piece, two (2) inch "standard" steel pipes conforming to the requirements of ASTM A53, Table X2. It must conform in detail with the mast arm shown on Drawing Number 840.
- (e) Mast Arm Attachment. The mast arm attachment to be welded to all mast arms will 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 can be fabricated from corrosion resistant steel plate such as "Cor-Ten" or approved equal. 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. The attachment must conform to the details shown on Standard Drawing 724. Provision must be made for fastening the attachment to each mast arm support by two special screws and washers as noted in Section 6.
- (f) 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.

- (g) 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 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 lengths will be accepted. The outer and inner surfaces of the pipes must be smooth and even without protrusions, nicks, holes or other imperfections.

## **PAINTING**

- 4. (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 SSPCS-SP10. Included in this process must be one to two inches of the interior section of the mast arm.
- (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°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°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 five percent (5%) NaCl solution at 95°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 otherwise specified in the order. A color chip sample must be submitted for approval prior to fabrication.

### **WELDING**

- 5. (a) Standards. Every weld must 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 employ in fabricating the mast arm.
- (b) Testing. The welds must be inspected for penetration and soundness by the magnetic particle inspection method or by radiography. If the magnetic inspection process is used, the dry method with direct current must be employed.

### **SCREWS**

- 6. 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.

### **MAST ARM TESTS**

- 7. (a) General. Tests must be made upon three (3) of the first fifty (50) arms in any order. An additional one (1) arm must be tested for each additional fifty (50) arms in the order.
- (b) 4-Foot Mast Arm. The 4-foot mast arm, when securely attached to a suitable and proper supporting structure, must withstand a side pull of not less than three hundred (300) pounds applied at a point three feet six inches (3'-6") from the connection to the supporting structure without failure of welds.
- (c) 8-Foot Mast Arms. The 8-foot mast arm, when securely attached to a

suitable and proper supporting structure, must withstand a side pull of not less than three hundred (300) pounds applied at a point seven (7) feet from the connection to the supporting structure without failure of the welds.

- (d) 12-Foot and 15-Foot Mast Arms. The 12-foot mast arm and the 15-foot mast arm, when securely attached to a suitable and proper supporting structure, must withstand a side pull of 300 pounds applied at a point seven (7) feet from the connection to the supporting structure without failure of the welds.
- (e) Rejection. If any of the mast arms in any lot fail to meet the test, an additional three (3) arms in the same lot must be tested. If any of these mast arms fail to meet the test requirements the entire lot will be subject to rejection, except that the manufacturer may subject each mast arm in the lot to the test, and those which meet the requirements will be accepted.
- (f) An Engineer from the Bureau of Electricity must be present to witness the testing procedures. If an engineer from the Bureau is unavailable, an independent consultant, approved by the Bureau, must witness and certify the tests. There will be no cost to the City for this. The contractor must include in his bid, the cost of travel, food and lodging for one (1) engineer. Travel for 150 miles or greater must utilize a major airline. Lodging accommodations must be equal to those provided at a Holiday Inn. The engineer must be given ten (10) working days notice of travel arrangements.

## **PACKAGING**

- 8. (a) General. The arms must be shipped in bundles. Each arm must be individually wrapped so that the arm can be bundled for shipping and unbundled for delivery without damage to the arm or its finish. Materials such as lumber(2"x4" 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 or breaking of the contents. Any bundles, in which either the mast 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 at no cost to the City. Each bundle must be capable of being lifted by a fork lift truck or crane and the bundles must be shipped in a flat bed truck to facilitate unloading. Each arm wrapping must be clearly labeled indicating the arm size, i.e. 8' STEEL LUMINAIRE MAST ARM.
- (b) The hardware 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.
- (c) All mast arms will be delivered to the Bureau of Electricity storage yard at



4101 South Cicero Avenue in Chicago, or to another location within the City as indicated on the order.

**THIS SPECIFICATION MUST NOT BE ALTERED**

**SPECIFICATION 1457  
BUREAU OF ELECTRICITY  
DEPARTMENT OF STREETS AND SANITATION  
CITY OF CHICAGO  
REVISED AUGUST 3, 2006**

**CABLE: SERVICE ENTRANCE,  
THREE INSULATED CONDUCTORS IN ONE OVERALL JACKET,  
600 VOLT**

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**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 must 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) U.L. 44
  - (6) U.L. 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 must 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 must 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 must 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 must 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 must 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  $121 \pm 1^\circ\text{C}$  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  $70 \pm 1^\circ\text{C}$ :

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 (-)  $25^\circ\text{C}$ .(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 must 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  $121 \pm 1^{\circ}\text{C}$  for 168 hours:
  - (1) Tensile strength, minimum percent of unaged value 75
  - (2) Elongation at rupture, minimum percent of unaged value 60
- (e) Mechanical Water Absorbtion. After 168 hours at  $70 \pm 1^{\circ}\text{C}$ :
  - (1) Milligrams per square inch, maximum 20

## TESTING

- 7. (a) General. Tests must be performed on insulation, jacket and completed cables in accordance with 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 Bureau of Electricity, will apply. All tests must be conducted on cable produced for this order.
- (b) Number of Tests. Insulation and jacket tests must 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) Witness Tests. If requested by the City, an engineer from the Bureau of Electricity must be present for testing. The contractor must include in his bid, the cost of travel, food and lodging for one (1) engineer. Travel for 150 miles or greater must utilize a major airline. Lodging accommodations must be equal to those provided at a Holiday Inn. The engineer must be given ten (10) working days notice of all travel arrangements.
- (d) Test Reports. No cable may be shipped until certified copies of all factory tests 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-  
manufacturers 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 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, 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 ( $\pm 10\%$ ) must 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

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1458  
BUREAU OF ELECTRICITY  
DEPARTMENT OF STREETS AND SANITATION  
CITY OF CHICAGO  
REVISED JULY 10, 2006**

**ELECTRICAL MANHOLE FRAMES AND COVERS  
24 INCH AND 30 INCH DIAMETER**

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**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 must 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 Streets and Sanitation 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 Streets and Sanitation, Bureau of Electricity, 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 Bureau of Electricity, 4101 South Cicero Avenue, Chicago, Illinois.



- (e) Warranty. The manufacturer must 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 must each conform in detail to the designs shown on Drawings 872, 874 and 10927.
- (b) Each frame and cover must weigh approximately as shown on the drawings.
- (c) Machining. The bearing surfaces of both the cover and the frame must 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 must 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 must 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 must each be considered a separate casting for determining the requirement of testing.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1462  
BUREAU OF ELECTRICITY  
DEPARTMENT OF STREETS AND SANITATION  
CITY OF CHICAGO  
REVISED AUGUST 3, 2006**

**RIGID STEEL CONDUIT  
(HOT DIPPED GALVANIZED)**

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**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 must be manufactured according to Underwriters Laboratories Standard U.L. - 6 and must meet ANSI Standard C 80.1 and the requirements of NEC Article 344. In addition, conduit must be recognized as an equipment grounding conductor as per NEC Article 250.118(2). There will be no exceptions to meeting these standards.
  - (c) Acceptance. Conduit not conforming to this specification will be rejected. The Commissioner will be the final judge in determining if the conduit meets the specification.
  - (d) Sample. If requested by the Chief Procurement Officer, a sample of conduit must be submitted to the Engineer of Electricity within fifteen (15) business days of receipt of such a request.
  - (e) Warranty. The manufacturer must warrant the construction and performance of the conduit to meet the requirements of this specification and must 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 put in service.

**STEEL**

3. Conduit must be formed from steel suitable for use as an electrical raceway. It must be structurally sound so that it will hang straight and true when supported by hangers in accordance with Chicago electrical code requirements and must be capable of being field bent without deformation of the walls.

Conduit must have a circular cross section sufficiently accurate to permit the cutting of threads in accordance with Table 2 and must provide a uniform wall thickness throughout. All surfaces must 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 must be thoroughly cleaned before application of zinc. The cleaning process must 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 must 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 must 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 must be delivered in bundles. Each length of conduit must be marked with the manufacturer's name or trademark. Securely attached to each bundle at two (2) locations on the bundle must be a weather resistant tag containing the following information:
  - a. conduit size
  - b. footage of bundle
  - c. gross weight of bundle

Precaution will be taken by the contractor in handling during shipment or delivery of conduit, and any conduit found to be damaged will not be accepted.

#### **TEST AND INSPECTION**

- 9. Galvanized rigid conduit must be capable of being bent cold into a quarter of a circle around a mandrel, the radius of which is four times the nominal size of the conduit, without developing cracks at any portion and without opening

the weld.

The protective coatings used on the outside and inside surfaces of rigid steel conduit must be sufficiently elastic to prevent their cracking or flaking off when a finished sample of 2 inch conduit is tested within one year after the time of manufacture, by bending it into a half of a circle around a mandrel, the radius of which is 3 1/2 inches.

Tests on sizes other than 1/2 inch may be conducted within one year after the time of manufacture. If such tests are conducted, the conduit must be bent into a quarter of a circle around a mandrel, the radius of which is six times the nominal size of the conduit.

One of the following three test methods must 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 must be so conducted as not to interfere with normal manufacturing processes.

Each length of conduit must 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 Diameter	Outside Diameter	Wall Thickness	Length Without Coupling	Minimum Weight of Ten Unit Length w/coup lings
(Inches)	(Inches)	(Inches)	(Inches)	(Feet/Inches)	(Pounds)
1/2	0.622	0.840	0.109	9-11 1/4	79.00
3/4	0.824	1.050	0.113	9-11 1/4	105.0
1	1.049	1.315	0.133	9-11	153.0
1 1/4	1.380	1.660	0.140	9-11	201.0
1 1/2	1.610	1.900	0.145	9-11	249.0
2	2.067	2.375	0.154	9-11	334.0
2 1/2	2.469	2.875	0.203	9-10 1/2	527.0
3	3.068	3.500	0.216	9-10 1/2	690.0
3 1/2	3.548	4.000	0.226	9-10 1/4	831.0
4	4.026	4.500	0.237	9-10 1/4	982.0

NOTE: The applicable tolerances are:

Length: + 1/4 inch (without coupling)

Outside diameter: + 1/64 inch or -1/32 inch for the 1 1/2 inch and smaller sizes,  
± 1 % for the 2 inch and larger sizes.

Wall thickness: - 12 1/2 %

TABLE 2

**Dimensions of Threads**

Nominal or Trade Size of Conduit (Inches)	Threads per Inch	Pitch Diameter at end of Thread (Inches) Tapered 3/4 Inch per foot	Length of Thread (Inches)	
			Effective L2	Overall L4
1/2	14	0.7584	0.53	0.78
3/4	14	0.9677	0.55	0.79
1	11 1/2	1.2136	0.68	0.98
1 1/4	11 1/2	1.5571	0.71	1.01
1 1/2	11 1/2	1.7961	0.72	1.03
2	11 1/2	2.2690	0.76	1.06
2 1/2	8	2.7195	1.14	1.57
3	8	3.3406	1.20	1.63
3 1/2	8	3.8375	1.25	1.68
4	8	4.3344	1.30	1.73

NOTE: The applicable tolerances are:

Threaded Length (L4 Col 5): Plus or minus one thread

Pitch Diameter (Col 3): Plus or minus one turn is the maximum variation permitted from the gaging face of the working thread gages. This is equivalent to plus or minus one and one half turns from basic dimensions, since a variation of plus or minus one half turn from basic dimensions is permitted in working gages.

**TABLE 3****Designed Dimensions and Weights of Couplings**

Nominal or Trade Size of Conduit <u>(INCHES)</u>	Outside Diameter <u>(INCHES)</u>	Minimum Length <u>(INCHES)</u>	Minimum Weight <u>(POUNDS)</u>
1/2	1.010	1-9/16	0.115
3/4	1.250	1-5/8	0.170
1	1.525	2	0.300
1 1/4	1.869	2-1/16	0.370
1 1/2	2.155	2-1/16	0.515
2	2.650	2 1/8	0.671
2 1/2	3.250	3-1/8	1.675
3	3.870	3-1/4	2.085
3 1/2	4.500	3-3/8	2.400
4	4.875	3-1/2	2.839

THIS SPECIFICATION MUST NOT BE ALTERED



**ELECTRICAL SPECIFICATION 1464  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
NOVEMBER 24, 1992**

**FUSES FOR STREET LIGHTING**

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**SUBJECT**

1. This specification covers the requirements for fuses to be used to protect street lighting circuits and luminaires. The fuses will installed in the fixture on fuse blocks, or in-line in in-line fuse holders.

**DESIGN**

2.
  - (a) Fuses shall be rated for H.I.D. ballast and street lighting protection.
  - (b) Fuses shall be fast acting, high interrupting capacity and current limiting.
  - (c) Fuses must be rated for 10A, 600 VAC and 100,000 AMPS symmetrical interrupting.
  - (d) Fuse dimensions must be 13/32" x 1-1/2".
  - (e) Fuses must be U.L. listed.
  - (f) Fuses shall be Buss fuse type KTK; Littlefuse type KLK; Gould (Chase-Shawmut) type CTK; or approved equal.

**SPECIFICATION 1465  
BUREAU OF ELECTRICITY  
DEPARTMENT OF STREETS AND SANITATION  
CITY OF CHICAGO  
REVISED JULY 12, 2006**

**GROUND RODS**

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**SUBJECT**

1. This specification states requirements for ground rods and clamps to be used for ground electrodes in street lighting, traffic signal, and miscellaneous electrical circuits.

**GENERAL**

2.
  - (a) Ground rods must be copper clad, steel rods suitable for driving into the ground without deformation of the rod or scoring, separation or other deterioration of the copper cladding.
  - (b) Sample. If requested by the Chief Procurement Officer, the contractor must furnish one sample of the ground rod proposed to be furnished within fifteen (15) business days from receipt of such request. The sample ground rod must be delivered to the Engineer of Electricity, 2451 S. Ashland Avenue, Chicago, Illinois 60608.
  - (c) Warranty. The manufacturer must 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 Streets and Sanitation will be the sole judge in determining which replacements are to be made.
  - (d) The Commissioner of Streets and Sanitation 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 must be made of steel core suitable for driving into the earth without deformation.
  - (c) A uniform covering of electrolytic copper, 10 mils in thickness, must 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 must be as specified in the order or in the plans. The length and diameter of the rod and the manufacturer must be clearly and permanently marked near the top of the rod (chamfered end).
  - (g) All ground rods must have a ground clamp capable of accommodating a No. 6 AWG Copper Wire.

**PACKING**

4.
  - (a) Ground rods must be packed in bundles with reinforced tape or plastic banding that will not damage the rods. Small bundles may then be bound in larger bundles held together with steel banding.
  - (b) Ground clamps must be packed in a suitable carton. The carton must be labeled to indicate the contents.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1467**  
**BUREAU OF ELECTRICITY**  
**DEPARTMENT OF STREETS AND SANITATION**  
**CITY OF CHICAGO**  
**MAY 12, 1993**

**ROD: ANCHOR, STEEL, WITH HARDWARE**

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**SUBJECT**

1. This Specification states the requirements for steel anchor rods with hardware for the street light pole foundations.

**GENERAL**

2. (a) Specifications. The anchor rods must 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 Streets and Sanitation, 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 must be as shown on the applicable drawing. It must include two (2) hexagonal nuts, American Standard Regular, two (2) flat washers, type B, series W, and one (1) lock washer, steel, helical spring. The nuts must have a Class 2 or 3 fit.

**FINISH**

5. (a) Galvanizing. The threaded end of each rod must be hot dipped galvanized for the distance shown on the applicable drawing. The thickness of the galvanized coating must not be less than 0.0021 inches. Each hexagonal nut and washer must be galvanized to the minimum thickness required by ASTM A-153, Class C, or ASTM B-454, Class 50. After galvanization, each anchor rod and nut must have a mating fit equivalent to the American Standard Class 2 or 3 fit for nuts and bolts.
- (b) Rust Inhibitor. With the hardware in place on the end of the bolt, the galvanized portion of the bolt must be coated with heavy No-Ox-Id or equal rust inhibiting greasy compound.

**TESTS**

6. At the discretion of the Commissioner, anchor rods and hardware furnished under this specification will be subject to testing to determine compliance with the materials physical requirements.

**INSPECTION**

7. Final inspection must be made at point of delivery. Any anchor rods and hardware rejected must be removed by the Contractor at his sole expense.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1474  
BUREAU OF ELECTRICITY  
DEPARTMENT OF STREETS AND SANITATION  
CITY OF CHICAGO  
REVISED MAY 26, 2005**

**CABLE: TRAFFIC SIGNAL CABLE  
MULTIPLE CONDUCTOR, COPPER WIRE, 600 VOLT  
CROSS-LINKED POLYETHYLENE INSULATION  
LOW SMOKE ZERO HALOGEN JACKET**

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1. SUBJECT

This specification states the requirements for a multiple cable to be installed in underground conduits and uses to distribute electrical energy to operate automatic traffic control equipment at street intersections within the City of Chicago.

2. INDUSTRY STANDARDS

Cable manufactured per this specification must meet and/or exceed all requirements of the latest editions of the standards listed below. Where this specification differs from the requirements of the below standards, this specification must take precedence. The cable must further meet and/or exceed those applicable standards not stated herein but referenced by the below standards.

UL 44	Thermostat Insulated Wires and Cables
UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
UL 1685	Vertical-Tray Fire Propagation & Smoke Release Test
IEEE 1202	Standard for Flame Testing of Cables for Use in Cable Tray in Industrial and Commercial Occupancies
IEEE 383	Flame Test Only / 210,000 BTU
ICEA T-29-520	Guide for Conducting Vertical Cable Tray Flame Tests With Theoretical Heat Input

	Rate of 210,000 B.T.U./Hour
ASTM B-8	Specification for Concentric-Lay-Solid Copper Conductor, Hard, Medium-hard, or Soft
ASTM B-33	Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes
ASTM D1894 *	Test method for Static and Kinetic Coefficients of Friction of Plastic Film and Sheeting
ASTM D2863	Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)

### 3. CABLES

(a) Construction. The cable must consist of coated conductors each concentrically encased with a XLPE Cross Linked Polyethylene insulation. In two-conductor cables, the insulated and covered conductors must be parallel and not twisted with suitable filler, as necessary, to produce a flat core minimum practicable dimensions. In the larger court cables suitable fillers must be used to produce an essentially round cross-section. A Mylar tape must be wrapped over the conductor assembly, and low smoke zero halogen, jacket applied overall.

(b) Outer Diameter. The maximum allowable outer diameter for round cables must be as follows:

<u>No. of Conductors</u>	<u>Outer Diameter</u> <u>(Inches)</u>
Seven	0.49
<b>Ten</b>	<b>0.69</b>
<b>Nineteen</b>	<b>0.90</b>

(c) Sealing. Both ends of each length of cable must be thoroughly sealed to prevent the entrance of moisture and other foreign matter.

### 4. COLOR CODE

Conductor identification must be provided by color synthetic-resin coverings, or an approved equal.

(a) The conductor must be Class B solid, compressed uncoated copper in accordance with the applicable standards listed in section 2.

5. INSULATION

The insulation system must be a cross-linked polyethylene meeting and/or exceeding the appropriate standards listed in Section 2 and the values stated in the following table. The insulation system must be a Single Cross Linked Polyethylene thermosetting, polyolefin material, consisting of an XLPE, optimized for superior electrical properties and optimized for premium mechanical protection. The insulation must be compatible with the conductor and a mylar separator tape must be applied between the conductor and the insulation. The insulation thickness must be per ICEA S-95-658, Table 3, 1A Column A: and the outer layer must be fully colorable.

<b>Conductor</b>	<b>Stranding</b>	<b>No. of</b>	<b>Insulation</b>
<b><u>Size AWG</u></b>	<b><u>(No. Of Wires)</u></b>	<b><u>Conductors</u></b>	<b><u>(Thickness (mils))</u></b>
<b>#14</b>	<b>1</b>	<b>7</b>	<b>30</b>
<b>#14</b>	<b>1</b>	<b>10</b>	<b>30</b>
<b>#14</b>	<b>1</b>	<b>19</b>	<b>30</b>

6. CABLE TAPE

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.

7. JACKET

(a) The jacket must be heavy low smoke zero halogen meeting the Physical and electrical requirements specified herein.

9. IDENTIFICATION

The insulation must be marked by means of surface or indent print with the following information; unmarked surfaces must not exceed 6 inches.



1. Manufacturer & plant of manufacture
2. Type and Size of Cable
3. Type of insulation, thickness and insulation level
4. Voltage Rating
5. Year of Manufacture
6. Sequential footage markings (at 2-foot minimum intervals)
7. US Cable Ratings:
  - LS
  - SUN RES
  - CT USE (where applicable)
  - UL 1685

10. PRODUCTION TESTS

Cable must be subjected to and pass all production tests as required by the appropriate standards listed in Section 2.

11. PACKAGING

- (a) Reels. The completed cable must be delivered on sound substantial nonreturnable reels. Both ends of each length of cable must be properly sealed against the entrance of moisture and other foreign matter by the use of clamp-on cable caps, such as Reliable Electric Company neoprene cable cap No. 1405, or equal. The ends must be securely fastened so as not to become loose in transit.
- (b) Footage. Each reel must contain the length of cable as set forth below. A tolerance limit of plus or minus five percent must be adhered to.

(1) Two-Conductor	2000 feet
(2) Seven-Conductor	2000 feet
(3) Ten-Conductor	2000 feet
(4) Nineteen Conductor	1000 feet
- c ( ) Marking. A metal tag must be securely attached to each reel indicating the reel number, contract number, date of shipment, gross and tare weights, the appropriate City Commodity Code Number as set below, and a description of the cable. Also, each reel must have permanent marking on it indicating directions for unrolling the cable and the footage of cable contained in the reel. Indelible ink or other such material susceptible to washing off or fading will not be permitted; and approved permanent marking material such as paint or a securely attached metal tag is required.

(d) Commodity Code Number

- |     |                    |                     |
|-----|--------------------|---------------------|
| (a) | Seven-Conductor    | 31-4686-5620        |
| (b) | Ten-Conductor      | <b>31-4686-5630</b> |
| (c) | Nineteen-Conductor | 31-4682-5645        |

**TABLE A                      COLOR CODE CONDUCTOR IDENTIFICATION**

<b>Base Color</b>	<b>First Tracer</b>	<b>Second Tracer</b>	<b>2 (# 6)</b>	<b>2 (# 4)</b>	<b>7</b>	<b>10</b>	<b>19</b>
<b>White</b>	<b>Black</b>	<b>Red</b>	--	--	--	--	<b>14</b>
<b>White</b>	<b>Red</b>	<b>Green</b>	--	--	--	--	<b>14</b>
<b>Black</b>	--	--	<b>6</b>	<b>4</b>	<b>14</b>	<b>14</b>	<b>14</b>
<b>White</b>	--	--	<b>6</b>	<b>4</b>	<b>14</b>	<b>14</b>	<b>14</b>
<b>Red</b>	--	--	--	--	<b>14</b>	<b>14</b>	<b>14</b>
<b>Green</b>	--	--	--	--	<b>14</b>	<b>14</b>	<b>14</b>
<b>Orange</b>	--	--	--	--	<b>14</b>	<b>14</b>	<b>14</b>
<b>Blue</b>	--	--	--	--	<b>14</b>	--	<b>14</b>
<b>White</b>	<b>Black</b>	--	--	--	<b>14</b>	--	--
<b>Red</b>	<b>Black</b>	--	--	--	--	<b>14</b>	<b>14</b>
<b>Green</b>	<b>Black</b>	--	--	--	<b>14</b>	<b>14</b>	<b>14</b>
<b>Orange</b>	<b>Black</b>	--	--	--	--	<b>14</b>	<b>14</b>
<b>Blue</b>	<b>Black</b>	--	--	--	--	<b>14</b>	--
<b>Black</b>	<b>White</b>	--	--	--	--	--	--
<b>Red</b>	<b>White</b>	--	--	--	--	--	<b>14</b>
<b>Green</b>	<b>White</b>	--	--	--	--	--	<b>14</b>

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1475  
BUREAU OF ELECTRICITY  
DEPARTMENT OF STREETS AND SANITATION  
CITY OF CHICAGO  
REVISED SEPTEMBER 26, 2006**

**CORD: TRAFFIC SIGNAL, EIGHT CONDUCTOR NO. 16 AWG, 600 VOLT**

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**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 must 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 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, 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 must warrant the cable to be first class material throughout. In addition to any other claims against them, if the cable is installed within six months of date of shipment, the manufacturer must replace any cable failing during normal and proper use within two years of date of installation. All replacements under this warranty must be made free of charge F.O.B. delivery point of the original contract.
- (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 must consist of stranded, coated, conductors each concentrically encased with a "free stripping," ethylene propylene rubber insulation. Suitable fillers must be used to produce an essentially round cross-section. The insulated conductors and the fillers must be cabled with a suitable left-hand lay as close together as is consistent with forming a core of minimum diameter. A Mylar tape must be wrapped over the conductor assembly, and a jacket applied overall.
- (b) Outer Diameter. The maximum allowable outer diameter must be one-half (0.50) inch.
- (c) Sealing. Both ends of each length of cable must be thoroughly sealed to prevent the entrance of moisture or other foreign matter.

**MARKING**

4. (a) Conductors. Identification must be provided by colors in accordance with I.M.S.A. Standards.
- (b) Jacket. The outer jacket must be marked as follows: "8/C 16 AWG 600V 90°C LSZH, name of manufacturer and date of manufacture. The height of letters must not be less than 1/8 inch in height and the message must repeat at approximately two (2) foot intervals. A sequential footage marking must be located on the opposite side of the jacket. All marking must be perfectly legible with permanent white ink.

**CONDUCTOR**

5. (a) Material. Round, Soft or annealed, stranded copper wire in accordance with ASTM B-3 and B-8, and coated in accordance with ASTM B33 (tin coated), must be furnished.
- (b) Size. The stranded conductor must consist of stranded wires twisted with an appropriate lay to form a No. 16 AWG conductor with an approximate diameter of 0.048 inches.

**INSULATION**

6. (a) Type. The insulation must be an easily strippable low smoke zero halogen (LSZH) thermosetting polyolefin compound or ethylene propylene rubber (EPR), or equal meeting or exceeding the requirements of ICEA S-95-658 and the additional requirements of this specification.
- (b) Rating. The insulation must be rated for continuous duty at 90°C in

accordance with U.L. AWM Style 3400.

- (c) Thickness. The insulated conductor must be circular in cross-section, concentric to the conductor, with a nominal insulation thickness of 0.031 inches (2/64") and a minimum spot thickness of 90% of the nominal thickness.

- (d) Initial Physical Requirements:

- |                                  |       |
|----------------------------------|-------|
| 1. Tensile strength, min., PSI   | 1,600 |
| 2. Elongation at rupture, min. % | 250   |

- (e) Air Oven Exposure Test. After conditioning in an air oven at  $158 \pm 1^\circ\text{C}$  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) Mechanical Water Absorption:

1. Gravimetric Method. After 168 hours in water at  $70 \pm 1^\circ\text{C}$ :

Water absorption, maximum, milligrams per square inch . . .5.0

- (g) Cold Bend Test Requirements. The completed cable must pass the "Cold-Bend," Long-Time Voltage Test on Short Specimens of ASTM D-470 except that the test temperature must be minus (-)  $25^\circ\text{C}$ .

- (h) Electrical Requirements:

1. Voltage Test. The completed cable must meet an A.C. and D.C. voltage test in accordance with ASTM D-470 and D-2655.

2. Insulation Resistance. The completed cable must have an insulation resistance constant of not less than 20,000 when tested in accordance with methods shown in ASTM D-470.

- (i) Flexibility Tests. A sample length of insulated conductor must be formed in a loose coil, placed in a circulating air oven, and aged for 168 hours at  $158^\circ\text{C} \pm 1^\circ\text{C}$ . The sample must then be allowed to cool to room temperature for one (1) hour and tightly wrapped around a 3X metal mandrel. The sample must show no cracks and must pass the same voltage test specified for the "Cold-Bend Test."

**JACKET**

7. (a) Type. The jacket must be a thermosetting low smoke zero halogen (LSZH) polyolefin compound or chlorinated polyethylene (CPE), or equal meeting the physical and electrical requirements specified herein.
- (b) Rating. The jacket must be rated for continuous duty at 90° C.
- (c) Thickness. The jacket must be circular in cross-section, concentric with the insulation, must have an average thickness not less than 45 mils and a spot thickness not less than ninety percent (90%) of the average thickness.
- (d) Initial Physical Requirements:
- |    |  |      |
|----|--|------|
| 1. | Tensile strength minimum PSI           | 1800 |
| 2. | Elongation at rupture, minimum percent | 300  |
- (e) Air Oven Exposure Test. After conditioning in an air oven at  $121 \pm 1^\circ\text{C}$  for 168 hours for LSZH or  $136 \pm 1^\circ\text{C}$  for CPE:
- |    |   |    |
|----|---|----|
| 1. | Tensile strength, minimum percent of unused value       | 75 |
| 2. | Elongation at rupture, minimum percent of unaged valued | 55 |
- (f) Mechanical Water Absorption. After 168 hours at  $70 \pm 1^\circ\text{C}$ :
- |    |                                     |    |
|----|-------------------------------------|----|
| 1. | Milligrams per square inch, maximum | 20 |
|----|-------------------------------------|----|

**TESTING**

8. (a) General. Tests must 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 an engineer from the Bureau of Electricity will apply.

All tests must be conducted on cable produced for this order. Where cable insulation and/or jacket thickness preclude obtaining samples of sufficient size for testing, special arrangements must be made with the engineer to obtain samples of unprocessed materials directly from the extrusion feed bins which will be separately processed and prepared for tests.

- (b) Number of Tests. Insulation and jacket tests must be conducted on samples taken every 25,000 feet or fraction thereof of each conductor size. In no case must samples be taken closer than 15,000 feet apart.
- (c) Witness Tests. Where the quantity of cable on a single purchase order is 100,000 feet or more, all insulation and jacket tests must be witnessed by an engineer from the Bureau of Electricity, if so requested by the City. Reels to be tested will be selected at random. The contractor must include in his bid, the cost of travel, food and lodging for one (1) engineer. Travel for 150 miles or greater must utilize a major airline. Lodging accommodations must be equal to those provided at a Holiday, Inn. The engineer must be given ten (10) working days notice of all travel arrangements.
- (d) Test Reports. No cable must be shipped until certified copies of all factory tests, including witness tests where applicable, have been reviewed and approved by the engineer.
- (e) Acceptance. Samples must be taken from each reel and must successfully conform to all tests specified herein. Reels from which samples fail to conform, will be rejected.

### **PACKAGING**

- 9. (a) Reels. The completed cord must be delivered on sound, substantial reels. The ends of the cable must be securely fastened so that they will not become loose during shipment and handling.
- (b) Footage. The number of feet per reel must be five hundred (500) feet plus or minus ten percent ( $\pm 10\%$ ).
- (c) Marking. A metal tag, or an approved indelible marking material such as alkyd enamel paint, must be used to mark the reel. The marking information must include, but not be limited to, the following: reel number, contract number, a description of the cord, and the footage of that particular reel.

THIS SPECIFICATION MUST NOT BE ALTERED



**ELECTRICAL SPECIFICATION 1487  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
OCTOBER 31, 1997**

**POLE: ORNAMENTAL, LOOP STYLE, 10 FOOT  
15" BOLT CIRCLE; STEEL, 7 GAUGE**

---

**SUBJECT**

1. This specification states the requirements for an ornamental street light pole. These poles will support a twin mast arm bracket which will in turn, support two tenon mounted luminaires. A split pedestal base will be provided to cover the bottom 43.75" of the pole. This pole will be served by underground cables.

**GENERAL**

2.
  - (a) Specifications. The poles 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, of which the most recently published revisions will govern.
  - (b) Acceptance. Poles not conforming to this specification will not be accepted.
  - (c) Sample. One complete anchor-base pole of the manufacture intended to be furnished must be submitted within fifteen (15) business days upon request of the Chief Procurement Officer.
  - (d) Drawings. The drawings mentioned herein are drawings of the Department of Transportation, Division of Engineering, being an integral part of this specification cooperating to state the necessary requirements.
  - (e) Bidders Drawings. Bidders must submit with their bids scale drawings for the anchor base pole intended to be furnished. The drawings must show details of the pole design including the handhole, grounding and anchoring. Although the luminaire, the twin arm bracket and the split pedestal base are each covered by separate specifications, the drawing must include every dimension necessary to show how all parts and components will fit each other, be easily installed and maintained and be properly held in assembly.

- (f) Interchangeableness. Each member including the handhole doors in the pole and the split pedestal base 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.
- (g) Design. The pole must conform in design and dimensions to Drawing 911.

### **MASTS**

- 3. (a) Mast Size. The mast size must be 10'-0" and must provide a 0.14" per foot taper. The mast diameter at a point 44" above the base must be 7.25". The mast must be rolled to provide a 16-flute pattern.
- (b) Mast Design. The mast design must be as shown on Drawing 911.
- (c) Material. The mast must be 7 gauge carbon steel in accordance with ASTM A595, Grade A and must provide a 0.14" per foot taper. 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.
- (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. It must provide for mounting on a 15" bolt circle using 1" to 1 1/4" anchor bolts, nuts and washers provided by others. Any special hardware required must be provided by the Contractor.
  - 2. It must provide sufficient internal clearance for two 3" conduit entries and a 3/4" ground rod.
  - 3. 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.
- (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 door frame carrying a removable door providing access to the interior of the mast must be welded into a close fitting opening centered approximately 15" above the bottom of the base. The door frame must be formed and welded of steel with cross section not less than 1-1/2" wide by

1/4" thick so as to adequately reinforce the opening of the mast. The internal horizontal clearance of the door frame 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 be drilled and tapped top and bottom to accept 1/4-20 hex head stainless steel machine screws.

- (g) Door. The removable door must be formed of sheet steel approximately 1/8" thick. It must fit the door frame closely and be dished so that it will stay in proper position even if its locking screws must be slightly loosened. The door must be drilled top and bottom to accept the 1/4 -20 hex head stainless steel machine screws which will fasten the door to the door frame. Half sections of 3/8" x 1" tubing must be welded to the door concentric with the drilled holes to prevent removal of machine screws after installation. Alternate methods will be subject to approval by the Commissioner or his fully authorized representative.
- (h) Tag. To each pole must be attached immediately above 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., 8.75" x 10'-7 gauge.
- (i) With pole set in place and the door securely fastened, there must be no exposed wires, bolts or appurtenant hardware other than the door fasteners.
- (j) Tenon. A tenon must be provided at the top of the pole for attachment of a twin mast arm bracket. The tenon diameter must be a minimum 5" I.P.S. pipe equivalent and must be sufficiently long to ensure positive, structurally sound mating between the mast and the attached device. 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 twin mast arm and two luminaires, the mast will not twist, rack, vibrate or otherwise deform when subjected to the severe vibrations of passing elevated trains or heavily loaded vehicles.

## **WELDING**

- 4. (a) General. Where welds are required and approved, each welded joint must be made in conformity with the proper interpretation of the standard welding symbols of the American Welding Society. 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) Certifications. Welders must have proper certification for the welding operations required. Welding by non-certified personnel will not be allowed.

- (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.

## **PAINTING**

- 5. (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 SSPCS-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° Fahrenheit 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 . The resin must be applied at a temperature of approximately 200° Fahrenheit 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° Fahrenheit and 95% relative humidity without

blistering. Before test, the panel must be scribed with an "X" down to bare metal.

- (h) Coating Measurement. Measurement of coating thickness must be done in accordance with SSPC-Pa 2-73T, "Measurement of Dry Paint Thickness with Magnetic Gauges," except that the lowest "single spot measurement" in an area of two square inches must not be less than 7.0 mils.
- (i) Color. Color must be gloss black. 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 as well as any other information required to purchase the same color for the mast arms, luminaire and the split pedestal base.
- (j) Field Touch-up. The Contractor must supply a field touch-up kit for every 20 poles or fraction thereof. The 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 light poles.

## **TESTING**

- 6. (a) General. All completed masts shall be available for testing. Unless specifically authorized in writing, all tests must be performed at the manufacturer's plant. A record of every test must be made and a certified copy must be submitted to the Commissioner before the poles are shipped.
- (b) Requirements. The following tests must be included in the testing procedure:
  - 1. Coupon tests as outlined in ASTM A53 and A595, A588 or A606.
  - 2. With the mast base rigidly secured using the normal mast mountings, a 1000 pound force must be incrementally applied, perpendicular to the mast at the tenon. This force must then be applied a second time at approximately the same location. The mast must then be checked to insure that the mast is still securely fastened; that it is plumb; and that no cracks have developed in either the mast, tenon or base.
  - 3. Perform Weld tests as described in "welding" section.
- (c) Acceptance. Tests must be made on 5% of all masts. If any of the masts fail to meet these tests, an additional three masts must be tested for each failed

mast. Should any of these additional masts fail to meet these test requirements, 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 to testing, and those masts which fulfill the requirements will be accepted.

## **PACKAGING**

7. (a) General. The poles shall be shipped in bundles weighing a maximum of 5,000 pounds. Each pole must be individually protected so that it can be bundled and unbundled, without damage to the pole or its finish. Where poles are delivered wrapped, 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 fibre based paper with a permanent ink so that instructions will be completely legible after weathering outdoors for a minimum of 5 years.
- (b) Bundles. The bundles shall 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 fork lift truck or crane and the bundles must be shipped on a flat bed truck to facilitate unloading.
- (c) Appurtenant Devices and Hardware. Any appurtenant devices and hardware not attached to the poles must be carefully wrapped and securely attached to each bundle. Payment will be withheld for any bundle delivered without the appurtenant devices and hardware. Cracked, broken, chipped or damaged parts will be considered as an incomplete delivery as regards payment.
- (d) Touch-up Paint. Touch-up paint and appurtenant materials must be packaged in units sufficient for twenty (20) poles. These units will be securely attached to a sufficient number of bundles to fulfill the touch-up paint requirements stated herein.

**ELECTRICAL SPECIFICATION 1488  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
REVISED JULY 15, 2002**

**PEDESTAL BASE: ORNAMENTAL, FOR 10 FOOT LOOP STYLE POLE**

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**SUBJECT**

1. This specification states the requirements for an ornamental, pedestal base (Clamshell) for mounting on the ornamental 10 foot Loop Style light pole. This specification will address the requirements for a split aluminum base with aluminum doors, a fiberglass base without doors, and non-metallic doors only.

**GENERAL**

2. (a) Specifications. The pedestal bases and/or doors 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. Bases and/or doors not conforming to this specification will not be accepted. Whenever “approval” and “approved” are used in this specification they will mean approval by the Commissioner. The Commissioner’s approval must be secured prior to proceeding with the manufacture of the bases and/or doors. The Commissioner will be the sole judge in determining if the submitted bases and/or doors are in compliance with the specification. The Commissioner’s decision will be final.
- (c) Drawings. The drawings mentioned herein are drawings of the Department of Transportation, Division of Engineering, being an integral part of this specification cooperating to state the necessary requirements.
- (d) Bidders Drawings. Bidders must submit with their bids detailed scale drawings of the pedestal bases and/or doors, and any necessary attachments. The drawings must give every dimension necessary to show how the parts will fit each other and be properly held in assembly. Shop drawings must be original engineering drawings created by the manufacturer; photocopied or scanned copies of the Standard Drawings will not be accepted. If so requested by the City, these drawings will be submitted in electronic format,

preferably Microstation 95. Failure to provide drawings in this format will be cause for rejecting the submittal.

- (e) Sample. One complete pedestal base and/or door of the manufacture intended to be furnished must be submitted within fifteen (15) business days upon request of the Chief Procurement Officer.
- (f) Products. Bases and/or doors and component equipment must be products of established manufacturers, and must be suitable for the service required. Aluminum bases may be manufactured by Union Metal Corporation, Holophane Corporation, or an approved equal. Fiberglass bases or doors may be manufactured by Shakespeare Company, W.J. Whatley, Incorporated, or an approved equal.
- (g) Warranty. The manufacturer shall warrant the performance and construction of the bases and/or doors to meet the requirements of this specification and shall warrant all parts and appurtenances against defects due to design, workmanship, or material developing within a period of three years after the bases and/or doors 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 cost of 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.
- (h) Design. The base and/or doors must conform to the design and dimensions of Standard Drawing 911.

### **OPTION 1. ALUMINUM BASE WITH DOORS**

- 3. (a) Each split pedestal base must be cast aluminum conforming to ASTM B26, Grade A356. Each base must be certified as aluminum alloy A356.
- (b) It must conform in detail with the split pedestal base shown on Drawing 911.
- (c) Castings must have smooth external surfaces free from protuberances, dents, cracks or other imperfections marring their appearance. Welding or plugging of casting defects is prohibited. All castings and parts must be permanently labeled for easy identification.
- (d) The two split base castings must be perfectly matched to each other and to the poles such that when they are attached to the mast, the base and mast assembly must appear as a one piece unit. No tolerance greater than 0.125" will be accepted.



- (e) The split pedestal base attachment to the mast must provide the structural integrity to ensure the base will not vibrate, twist or bounce during the sidewalk movement experienced when an elevated train or heavily loaded vehicle passes. Where set screws are used to secure the base to the mast, 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. The set screws must be 1/4" x 20 stainless steel Allen head screws. A minimum of four set screws must be provided. Set screws must be black.
- (f) The split pedestal base must provide an entry door whose appearance and fit is in consonance with the mast and base design both aesthetically and structurally.
  - 1. The door must be securely fastened in place with four 1/4"-20 hex head screws, which will thread into a rigid door frame. The door frame must be drilled and tapped. The door must be drilled only. The screws must be stainless steel.
  - 2. All doors must be interchangeable with any other base. Bases whose doors are matched to a single base will be rejected.
  - 3. The door must be positioned in the base such that the base can be attached to the mast with the base door, in perfect alignment with the mast door.
  - 4. The door must provide ample room for a worker to reach into the base with hand tools, open the mast door, splice wires, change fuses and read the identification tag on the mast.

#### **OPTION 2. FIBERGLASS BASE WITHOUT DOORS**

- 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 the Loop Pole.
- (b) The base must conform in detail and dimensions to Standard Drawing 911. With the exceptions that the material must meet the requirements of Section 6.a. and there will be no doors.
- (c) The two halves of the clamshell must be identical to each other. They must be perfectly matched and when installed there must 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) Set screws must be used at the top of the base to attach the base to the mast, giving the base some rigidity and allowing the base to be positioned level. There must be four set screws (two in each half) evenly spaced at 90°. The set screws will be 1/4"-20 allen head steel screws. The set screws must be black.
- (e) The color of the base must be gloss black and must match the color of existing and proposed Loop Poles. The resin must contain color pigment throughout. The pigment must be even throughout 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 must be equal to that of the aluminum cast base. Acceptance of the aesthetic appearance of the base will be by the Commissioner.
- (g) The two halves of the clamshell must be affixed by means of screws. The screws must fit so that the halves of the base are drawn together as the screws are tightened. The halves should fit snug against each other. Threaded stainless steel inserts in the base must be used to affix the screws. The screws must be flush with the surface of the base and 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.

### **OPTION 3. NON-METALLIC DOORS**

- 5. (a) Each base door must be formed of fiberglass (as described in Section 6.) or from another non-metallic material. The material must be UV and weather resistant. Any material other than fiberglass must be approved by the Commissioner. Each door must have a permanent marking on the back describing the part as a door for a Loop Pole.
- (b) The door must conform to the detail and dimensions of Standard Drawing 911. All doors must be interchangeable.
- (c) The color of the door must be gloss black and must match the color of the existing and proposed Loop Poles and bases. The non-metallic door must be pigmented throughout the material. The pigment must be even throughout the thickness of the door. A finish of urethane enamel must be applied to the door surface to a minimum dry thickness of 1.5 mils. A sample of the door

with paint must be submitted for approval prior to production.

- (d) The door appearance must be of a texture and of a fit that it will appear to be a part of the original base. Acceptance of the aesthetic appearance and fit of the door will be by the Commissioner.
- (e) The doors must be securely fastened in place with four 1/4"-20 hex head screws which will thread into the base frame. The door will be properly drilled to accept the screws. The door holes must not be tapped. The screws must be stainless steel. Screws must be supplied. Alternate methods of attachment will be considered.

### **WELDING FOR ALUMINUM BASES**

- 6. (a) General. It is preferred that each half of the split pedestal base is cast as a single unit. Where the Contractor proposes to provide separate castings which are welded together, the Contractor must provide detailed drawings and a sample for the specific written approval of the Commissioner. Appearance will be a major factor in the approval process.
- (b) Standards. Every weld must be made in conformity with the proper interpretation of the standard welding symbols of the American Welding Society as indicated on the drawings. Additionally, each bidder must submit with his proposal drawing the sizes and types of welds, must state the type of electrode, and must describe the welding methods he proposes to employ in fabricating the split base.
- (c) Certification. All welds must be made by personnel who are certified for that type of welding. Welding by non-certified personnel will not be allowed.
- (d) Testing. All welds of 5% of the bases in every lot must be inspected for penetration and soundness by means of radiography or by the magnetic particle inspection method. The proposed weld inspection method must be submitted with the proposal.

### **PAINTING OF ALUMINUM BASES**

- 7. (a) Oil and Grease Removal. All metal surfaces must be washed with an alkaline detergent to remove oils and 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) Exterior and Interior Coat. A thermosetting, weathering, Polyester powder coat must be applied electrostatically to all cleaned and treated surfaces to a

uniform eight-mil thickness in a one coat application. This powder coat must be cured in a convection oven at a minimum temperature of 400° Fahrenheit to form a high molecular weight fusion bonded finish.

- (d) 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.
- (e) 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° Fahrenheit and 95% relative humidity without blistering. Before test, the panel must be scribed with an "X" down to bare metal.
- (f) 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.
- (g) Color. Color must be gloss black. A color sample must be submitted for approval prior to fabrication. The color sample must include the manufacturer's name and the manufacturer's color name as well as any other information which will be required to purchase the same color for the mast, mast arm and luminaires.
- (h) Field Touch-up. The Contractor must supply a field touch-up kit for every 20 bases or fraction thereof. The kit must consist of a highly legible instruction sheet, one gallon of the recommended touch-up paint and all other material required to touch-up 20 bases.

#### **FABRICATION REQUIREMENTS FOR ALUMINUM BASES**

- 8. (a) The manufacturer must demonstrate that the foundry proposed to fabricate the aluminum bases will meet or exceed the following requirements. The manufacturer must provide foundry qualifications using published capacity data. The manufacturer must identify the molding and core equipment proposed for use in fabricating the bases. The foundry must submit a written Quality Assurance Plan which includes testing.

#### **TESTING**

- 9. (a) General. All completed split pedestal bases and/or doors shall 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.

- (b) Requirements for aluminum bases. All aluminum bases shall be available for testing. The following tests must be included in the testing procedure:
  - 1. Bar tests as outlined in ASTM B26.
  - 2. Weld tests as described in Section 6.
- (c) Requirements for fiberglass bases and non-metallic doors. All completed fiberglass bases and non-metallic doors shall be available for testing. The manufacturer must provide evidence that the bases and doors are structurally sound and are able to withstand the normal abuse of salt spray, freeze-thaw cycles, and exposure to moisture. The bases and doors must be impact resistant and must be resistant to UV damage.
- (d) Acceptance Tests must be made on 5% of all the split pedestal bases and/or doors. If any of the units fail to meet these tests, an additional three units must be tested for each failed one. Should any of these additional units fail to meet these test requirements 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 base and/or door to testing, and those units which fulfill the requirements will be accepted.

## **PACKAGING**

- 10. (a) General. The split pedestal bases must be shipped on pallets with at least six units per pallet. Each base must be individually protected so that it can be bundled and unbundled without damage to the base or its finish. Where bases are delivered wrapped, 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 fibre-based paper with a permanent ink so that instructions will be completely legible after weathering outdoors for a minimum of five years. Doors must be individually wrapped and packaged in cartons. The cartons must be labeled in 3/8 inch high lettering indicating the type of door ( i.e. FIBERGLASS DOOR FOR LOOP LIGHT POLE BASE), the part number, the manufacturer, the date of manufacture, and the contract number.
- (b) Appurtenant Devices and Hardware. Any appurtenant devices and hardware not attached to the bases must be carefully wrapped and securely attached to each pallet. Hardware for doors must be packaged in a clear bag with a label indicating the type of hardware, the quantity of hardware, and the associated

door type. Hardware for doors must be in the same carton as the doors. Payment will be withheld for any pallet or carton delivered without the appurtenant devices and hardware, or for any missing or improper packaging or labeling. Cracked, broken, chipped or damaged parts will be considered as an incomplete delivery as regards payment.

- (c) 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 1489  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
JUNE 9, 1997**

**MAST ARM: ORNAMENTAL, FOR LOOP STYLE POLE, FOR MOUNTING  
TWO ACORN LUMINAIRES, ALUMINUM**

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**SUBJECT**

1. This specification states the requirements for an ornamental aluminum twin mast arm for supporting two acorn luminaires on both the Loop pole and the Extended Loop pole.

**GENERAL**

2. (a) Specifications. The mast arms shall conform in detail to the requirements herein stated, and to the Specifications and Methods of Test of the American Society for Testing and Materials cited by ASTM Designation Number, of which the most recently published revision will govern.
- (b) Acceptance. Mast Arms 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, being an integral part of this specification cooperating to state the necessary requirements.
- (d) Bidders Drawings. Bidders must submit with their bids detailed scale drawings of the mast arms and attachments proposed as the means for attaching these mast arms to poles. The drawings must give every dimension necessary to show how the parts will fit each other and be properly held in assembly.
- (e) Sample. One complete mast arm of the manufacture intended to be furnished must be submitted within fifteen (15) business days upon request of the Chief Procurement Officer.
- (f) Warranty. The manufacturer shall warrant that the mast arms meet the requirements of this specification and shall warrant the mast arms against any defects or failures that may occur within one (1) year of acceptance. Any

defective mast arm must be replaced by the manufacturer at no cost to the City.

### **DESIGN**

3. (a) Each twin mast arm must be cast aluminum conforming to ASTM B26/B26M, Grade 319.
- (b) It must conform in detail with the twin mast arm shown on Drawing 911.
- (c) Castings must have smooth external surfaces free from protuberances, dents, cracks or other imperfections marring their appearance. Welding or plugging of casting defects is prohibited.
- (d) Mast arms must be straight and true along both the longitudinal and vertical axis so that they will provide a perfect, parallel vertical mounting for the two luminaires.
- (e) Mast arms must be structurally rigid so that when mounted on a mast, fitted with the capitals and luminaires shown on Drawing 911, and carrying two 4' x 14" banners with each top securely fastened to one side of the mast arm and each bottom securely fastened to the mast, neither an 80 m.p.h. AASHTO wind load, the vibration of a passing elevated train, nor the vibration of a heavily loaded vehicle will cause any twisting, racking or bouncing of the arm assembly in either the vertical or the horizontal plane.
- (f) The mast arm attachment to the mast must provide the structural integrity to hold the mast arm firmly in place during the loading and vibration described above. Where set screws are used to secure the mast arm to the mast, 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. The set screws must be 1/4" x 20 stainless steel Allen head screws and a minimum of three set screws must be provided.
- (g) An access point near the top of the mast arm must be provided to facilitate wiring from the fixture to the mast handhole. The access point cover must be in architectural consonance with the mast arm and must be securely held in place with a minimum of two 1/4" x 20 stainless steel allen head set screws in a minimum of 3/16" thickness of metal. At this access point, a "J" hook must be provided to support the luminaire wiring so that rubbing on the interior raceway will be minimized.
- (h) The interior of the mast arm must provide a smooth, burr-free raceway for the luminaire wiring.
- (i) The mast arm must provide two 3"O.D. x 3" long tenons for attachment of



the luminaires.

## **WELDING**

4. (a) General. It is preferred that the mast arm be cast as a single unit. Where the Contractor proposes to provide separate castings which are welded together, the Contractor must provide detailed drawings and a sample for the specific written approval of the Commissioner. Appearance will be a major factor in the approval process.
- (b) Standards. Every weld must be made in conformity with the proper interpretation of the standard welding symbols of the American Welding Society as indicated on the drawings. Additionally, each bidder must submit with his proposal drawing the sizes and types of welds, must state the type of electrode, and must describe the welding methods he proposes to employ in fabricating the mast arm.
- (c) Certification. All welds must be made by personnel who are certified for that type of welding. Welding by non-certified personnel will not be allowed.
- (d) All welds must be inspected for penetration, soundness and appearance by means of radiography.

## **PAINTING**

5. (a) Oil and Grease Removal. All metal surfaces must be washed with an alkaline detergent to remove oils and 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) Exterior and Interior Coat. A thermosetting, weathering, Polyester powder coat must be applied electrostatically to all cleaned and treated surfaces to a uniform eight-mil thickness in a one coat application. This powder coat must be cured in a convection oven at a minimum temperature of 400 degrees Fahrenheit to form a high molecular weight fusion bonded finish.
- (d) Alternate Methods. Alternate painting methods may be reviewed and tested on a case by case basis. However, no painting method will be accepted unless the Commissioner judges such alternate to be equal to the coating herein specified.
- (e) 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° Fahrenheit and 95% relative humidity without blistering. Before test, the panel must be scribed with an "X" down to bare

metal.

- (f) 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.
- (g) Color. Color must be gloss black. A color sample must be submitted for approval prior to fabrication. The color sample must include the manufacturer's name and the manufacturer's color name as well as any other information which will be required to purchase the same color for the mast, mast arm and luminaires.
- (h) Field Touch-up. The Contractor must supply a field touch-up kit for every 20 bases or fraction thereof. The kit must consist of a highly legible instruction sheet, one gallon of the recommended touch-up paint and all other material required to touch-up 20 mast arms.

## **TESTING**

- 6. (a) General. All completed mast arms shall 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 arms are shipped.
- (b) Requirements. The following tests must be included in the testing procedure:
  - 1. Bar tests as outlined in ASTM B26/B26M.
  - 2. With the mast arm rigidly secured to a tenon equivalent to that of the pole and using the normal mast arm mounting provision, a 300-pound test load must be applied perpendicular to one end of the mast arm in the vertical plane for approximately 60 seconds. The test must then be repeated on the other end of the mast arm.
  - 3. The 300-pound test load must then be applied to one end of the mast arm to create a twisting moment on the arm for approximately 60 seconds. The test must then be repeated on the other end of the mast arm.
  - 4. The 300-pound test load must then be applied perpendicular to one end of the mast arm in the horizontal plane for approximately 60 seconds. The test must then be repeated on the other end of the mast arm.
  - 5. The mast arm mounting must not be adjusted or retightened during

any of the above testing procedures.

6. During the tests, the mast arm must not rack, twist, bend or deform in any manner using measurement criteria and tolerances which will be mutually agreed upon by the Contractor and the Commissioner prior to testing. They must be based on normal testing procedures and the physical properties of the material.
  7. At the completion of these tests, the mast arm must be in precisely the same position it was in at the start of testing and must not be structurally or visibly deformed in any matter whatsoever. Where welds are used in the manufacture of the arms, they must be subjected to testing by means of radiography to insure that they have not been compromised.
- (c) Acceptance Tests must be made on 5% of all the mast arms. If any of the mast arms fail to meet these tests, an additional three mast arms must be tested for each failed mast arm. Should any of these additional mast arms fail to meet these test requirements 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 to testing, and those mast arms which fulfill the requirements will be accepted.

## **PACKAGING**

7. (a) General. The mast arms shall be shipped on pallets of 6 mast arms. Each base must be individually protected so that it can be bundled and unbundled without damage to the mast arm or its finish. Where mast arms are delivered wrapped, 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 mast arms. 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 five years. Any pallets, in which either mast 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 pallet to its original destination at no cost to the City of Chicago.
- (b) Appurtenant Devices and Hardware. Any appurtenant devices and hardware not attached to the mast arm must be carefully wrapped and securely attached to each pallet. Payment will be withheld for any pallet delivered without the appurtenant devices and hardware. Cracked, broken, chipped or damaged parts will be considered as an incomplete delivery as regards payment.

- (d) Touch-up Paint. Touch-up paint and appurtenant materials must be packaged in units sufficient for the number for 20 mast arms. These units will be securely attached to each bundle.

**SPECIFICATION 1493  
BUREAU OF ELECTRICITY  
DEPARTMENT OF STREETS AND SANITATION  
CITY OF CHICAGO  
MARCH 20, 2000**

**TRAFFIC SIGNAL: VEHICULAR, TWELVE-INCH  
SINGLE FACE, SINGLE OR MULTIPLE-SECTION,  
POLYCARBONATE, LED OR INCANDESCENT**

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**12. GENERAL REQUIREMENTS**

- 1.1 This specification states the requirements for twelve-inch, single face, single and multiple-section, traffic signals with polycarbonate housings, using LED or incandescent light source, for use in the traffic control system of the City of Chicago. Units include red ball, yellow ball, green ball, red arrow, yellow arrow, and green arrow.
- 1.2 Sample and Certified Test Reports. One complete signal, fully assembled and wired, of the manufacture proposed to be furnished, must be submitted along with the required certified test reports, within fifteen (15) business days upon request of the Chief Procurement Officer. The sample must be delivered to the Engineer of Electricity, Bureau of Electricity, 2451 South Ashland Avenue, Chicago, Illinois 60608.
- 1.3 Standards. Equipment furnished under this specification must meet the appropriate requirements of the following standards, as required within the body of this specification:
- American Association of State Highway and Transportation Officials (AASHTO)  
American Society for Testing and Materials (ASTM)  
Institute of Transportation Engineers (ITE)  
National Electrical Manufacturers Association (NEMA)  
Underwriters Laboratories (UL)
- 1.4 Approval. Approval will mean approval in writing by the Commissioner or his/her duly authorized representative.
- 1.5 Warranty. The manufacturer must 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 three (3) years from date of acceptance. In addition, LED optical units must carry a

seven (7) year warranty against failure or loss of color (chromaticity) and signal brightness (luminance) below minimum acceptable VTCSH standard levels from date of final acceptance for contract construction, or date of delivery on a specific order. In the event defects or failures occur in the LED units during the warranty period, the manufacturer must replace all defective units, at no expense to the City. This warranty must 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.

## 2. **MATERIALS AND EQUIPMENT REQUIREMENTS**

2.1 The traffic signal heads must 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 must meet or exceed the following tests:

TEST	REQUIRED	METHOD
Specific gravity	1.17 minimum	ASTM D 792
Vicat Softening temp	310-320° F	ASTM D 1525
Brittleness temp.	-200° F	ASTM D 746
Flammability	Self-extinguishing	ASTM D 635
Tensile strength, yield	8,500 PSI	ASTM D 638
Elongation at yield	5.5-8.5%	ASTM D 638
Shear strength, yield	5,500 PSI min.	ASTM D 732
Izod impact strength (notched, 1/8" thick)	12-16 ft-lbs/in.	ASTM D 256
Fatigue strength (at 2.5 mm cycles)	950 PSI min.	ASTM D 671

(b) Assembly. A traffic signal section must 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 must 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 must 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 must be fastened together with a coupling washer assembly composed of two washers, three zinc plated bolts, nuts, and lock

washers which lock the individual sections together. As an alternative, individual sections may be fastened together with four cadmium plated bolts, lock washers, and nuts. The hole in the coupling washer assembly must accommodate three 3/4 inch cables.

- (d) Height. The overall height of an assembled traffic signal must be fourteen (14) inches for a single-section signal, forty-two (42) inches for a three-section signal, and seventy (70) inches for a five-section, plus or minus one (1) inch.
- (e) Mounting. The traffic signal must be designed for mounting with standard traffic signal brackets using 1-1/2 inch pipe size fittings.
- (f) Positioning Device. The top and bottom opening of each housing must have integral serrated bosses that will provide positive positioning of the signal head in five degree increments. A total of 72 teeth must be provided in the serrated bosses to allow the signal face to be rotated 360 degrees about its axis. The teeth must be clean and well defined to provide positive positioning.
- (g) Hinges. The signal housing must be sectional; one section for each optical unit. Each housing must have four integral hinge lugs, with stainless steel hinge pins (AISI 304 or equivalent), located on the left side for mounting the door. The hinge pins must be straight and not protrude past the outside of the housing lugs. The housing must have two integral latching bolt lugs on the right side each with a stainless steel hinge pin to which a latching bolt (AISI 304 or equivalent), washer, and wing nut will be attached. The wing nuts must be captive. Each housing must be equipped with holes to be used for mounting backplates.
- (h) Door. The door 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 (2) hinge lugs on the left side and two (2) sets of latch screw jaws centered on the right side, as viewed from the front of the signal, must be integrally cast with the housing door. The door must be hinged to the housing with two (2) stainless steel hinge pins, drive fitted. Two (2) stainless steel latch screws and wing nut and washer assemblies on the latch side of the housing body must provide for opening and closing the door without the use of tools. The door must have eight (8) holes with threaded metal inserts for stainless steel machine screws to secure the visor(4 holes) and the lens(4 holes). The inside of the door must be grooved to accommodate a one piece, air-cored EPDM (ethylene propylene diene monomer) gasket to provide a weatherproof and dust proof seal when the door is closed. The inside of the door must have four equally spaced threaded metal inserts for the lens attachment. The outside of the door must have an integral rim completely encircling the lens opening to prevent leakage

between the door and the lens. The rim must have four equally spaced tabs around the circumference with threaded metal inserts for the visor.

- (i) Visor Each traffic signal must have a visor for each signal indication (section). The visor must be the tunnel type, nine and one-quarter inches (9-1/4") long, fabricated of ultraviolet stabilized polycarbonate resin of the specified color, injection molded. The visor must fit tightly against the door and not permit any light leakage between the door and visor. All hardware necessary for, but not limited to, attachment of the visor must be of stainless steel. The visor must have four mounting lugs for attaching the visor to the door. Screws must go through the visor lugs into the metal inserts in the door to secure the visor.

2.3 The traffic signal heads must be provided with incandescent or LED optical units as specified in the line item or Contract Plans.

#### 2.3.1 INCANDESCENT OPTICAL UNITS

- (a) Incandescent Optical Unit. The incandescent optical unit consists of the lens, reflector and lamp holder. The optical unit and visor must 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 must be designed and assembled so that no light can escape from one indication to another.
- (b) Lenses. The red, yellow and green polycarbonate lenses must be round with a nominal twelve (12) inch diameter and must conform to all requirements set forth under the heading "Traffic Signal Lenses" in the ITE standard. The red, green or yellow arrow lenses must be round with a nominal twelve (12) inch diameter and the outside surface must be covered, except for the arrow, with a dull or dark grey opaque material of a thickness sufficient to totally hide the light from a 2000-lumen lamp placed behind it operating at rated voltage. The opaque material must be hard and durable and must 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 must be of an approved design with a minimum stroke of fifteen-sixteenths (15/16) inch. The arrow must appear uniformly illuminated when viewed from angles usually encountered in service, whatever may be the angular position of the lens in the signal section. The lens must be enclosed by an air-cored EPDM (ethylene propylene diene monomer) gasket providing a weather proof and dust proof seal between the lens, door, and reflector assembly. The gasketed lens must be secured to the housing door by four (4) stainless steel screws (AISI 304 or equivalent) and clamps equally spaced around the lens opening. The door must have threaded metal inserts to receive the screws.
- (c) Reflector. The reflector must 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 must be mounted in such a way as to seal the internal optical system by being compressed against the lens gasket when the signal door is closed. The reflecting surface must be an "ALZAK" class SI specular finish having a minimum reflectivity of eighty-two (82) percent and a protective oxide coating of 7.5 milligrams per square inch, minimum. The reflectivity must be determined with a Taylor-Baugartner Reflectometer, and the weight of the protective oxide coating by the method of test outlined in ASTM B 137. The reflecting surface must be tested for proper sealing by applying one (1) drop of a water solution (1 gram per 50 cc) of Anthraquinone Violet R at a room temperature. After five (5) minutes, the dye must be washed from the surface with running water. No stain must remain after the surface is lightly rubbed with a soft cloth wet with mild soap and water, and rinsed with water. The reflector must have an opening in the back to accommodate the lamp holder.

- (d) Lamp Holder. The lamp holder must have a heat, moisture and weatherproof molded phenolic housing designed to accommodate a standard 133 watt, 3 inch light center length, incandescent lamp. The lamp holder must be so designed that it can be readily rotated and positively positioned to provide proper lamp filament orientation and focus. The inner brass shell, or ferrule, of the lamp holder must have a grip to prevent the lamp from working loose due to vibration. A gasket must be furnished at the junction of the lamp holder and the reflector.

### 2.3.2 LIGHT EMITTING DIODE (LED) OPTICAL UNITS

- (a) Light emitting diode (LED) optical units 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 signal color, and electronic and electrical components necessary to permit operation at nominal 120 volt, 60 hertz power.
- (b) The LED unit must be of such dimensions as to permit mounting in any standard traffic signal housing, be interchangeable with incandescent optical units, and must include appropriate gasket for this purpose. Gasketing provided must provide a watertight seal meeting existing ITE standard for signal heads, and exclude the infiltration of moisture into either the signal housing or into the LED optical unit case.
- (c) The LED unit must meet the applicable requirements of the ITE standards for Vehicle Traffic Control Signal Heads (VTC SH) Part 2: LED Vehicle Signal Modules, for color (chromaticity), signal brightness (luminance), and beam spread (luminance at various vertical and horizontal angles). Yellow LED

modules must meet the green module requirements for brightness.

- (d) Minimum brightness of LED signal units must be in accordance with the luminous requirements in a standard testing procedure as defined by Section 4 of the VTCSH Part 2: LED Vehicle Signal Modules. During the required operating life of LED signal units, the luminance output of the units must not be less than 60 percent (.60) of the values specified in the standard.
  - (e) Unit lenses must be twelve inches in diameter and be constructed of ultraviolet (UV) stabilized, impact resistant polycarbonate, acrylic or other approved material. Lenses must be clear or tinted.
  - (f) Units must consist of LEDs uniformly distributed to present a homogeneous appearance on the face of the lens from a wide viewing angle.
  - (g) LEDs must be wired so that the loss of a single LED or a string of LEDs will not reduce the luminescence below the minimum requirement.
  - (h) For purposes of this specification, failure of a single unit is defined as an occurrence where the luminescence of the signal measured in candela in standard test procedures is less than the required initial luminance or luminance at time points and conditions specified; or where minimum required brightness is achieved, but two or more series strings of LEDs or in excess of twenty percent of 20% of LEDs are not operable.
  - (i) Unit power supply must be constant current regulated and filtered to provide instant on indications, and to prevent momentary signal outages or flicker. Units must be fully operable over a range of 90 volts to 130 volts at 60 hertz, plus or minus 3 hertz.
  - (j) Surge protection: Each unit must be provided with integral surge protection to withstand transient of 600 volt, 100 microsecond rise and 1 millisecond pulse width. The surge protector must provide full electrical and physical protection to all unit components.
  - (k) Maximum permissible power consumption at ambient conditions (nominal 120 volts, 60 hertz, 70 degrees F.) must be 30 watts at a minimum 90 percent power factor. Power consumed must not vary by more than ten (10) percent from nominal power consumption over voltage range of 105 volts to 125 volts, and over permissible environmental ranges.
- (l) Units must be fully operable at temperature ranges of -40 degrees F. (-40 deg C) to +165 degrees F. (+74 deg C) at up to 100 percent relative humidity.

- (m) Units must be clearly marked on the back surface of the unit in a permanent manner showing information required for warranty and long term performance. Information to be shown must include manufacturer name, date of manufacture, electric power requirements, signal model type including color and indication type, and signal serial number.
- (n) The LED unit must 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 must be compatible with the NEMA TS-1 and later traffic signal load switches and conflict monitors.
- (o) Units must meet applicable sections of Title 47, SubPart B, Section 15 of the Federal Communications Commission (FCC) rules as applies to electronic noise limitation and electromagnetic interference.
- (p) Total harmonic distortion (THD) induced into the voltage and current AC power line sine waves must not exceed 20 percent.
- (q) LED optical units must meet the requirements of VTCSH Part 2: LED Vehicle Signal Modules Section 6.3.1 for signal burn-in.

2.4 Wiring. Each lamp holder must be furnished with two (2) leads color coded as follows:

White	Common
Red	Red Lens Section
Yellow	Yellow Lens Section
Green	Green Lens Section
Green with Black Tracer	Green Arrow Lens Section
Yellow with Black Tracer	Yellow Arrow Lens Section
Red with Black Trace	Red Arrow Lens Section

The lead must be type TEW No. 18 AWG stranded copper wire with 2/64 inch thick, 600 volt, 105 degree centigrade rated, thermo-plastic insulation meeting MIL-W-76A specifications. The lead must connect to the terminal strip without being spliced. The ends of the lamp leads must be stripped of one-half inch (2") of insulation and tinned.

2.5 Terminal Strip. A dual-point, barrier type terminal strip with a solid base and pressure plate type connectors (Marathon Special Products Corporation Catalog No. TB-305-SP, or equal) must be securely attached at both ends to the housing body inside the "Green" section of the signal head.

- 2.6 Cable. One, eleven foot (11') length of flexible electric cord, medium duty, type SO, No. 16 AWG stranded copper conductor, color coded, rubber insulated, neoprene jacketed, must be furnished with each signal head. The number of conductors must include neutral, ground, and one switch leg for each section. Both ends of each cable length must be carefully stripped of six inches (6") of jacket and one inch (1") of insulation, and each conductor properly tinned.
- 2.7 Gaskets. Wherever necessary to make a completely dustproof, moistureproof and weatherproof assembly of the housing and optical system, approved type gaskets of neoprene or silicone rubber must be provided.

### **3. TESTING AND DOCUMENTATION REQUIREMENTS**

- 3.1 Documentation. The contractor must provide certified manufacturing and testing documentation to demonstrate that the traffic signals being supplied meet or exceed the specification requirements. The LED Optical Units must be tested by an independent and certified testing laboratory.
- 3.2 Inspection. The signals will be subject to inspection at the discretion of the Commissioner. Final inspection must be made at point of delivery. Any signal rejected must be removed and disposed of by the contractor at his sole cost.

### **4. PACKING**

- 4.1 Packing. Each traffic signal assembly must 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 must be clearly marked on the outside in letters not less than three-eighths (3/8) inch tall with the legend: "TRAFFIC SIGNAL, TWELVE-INCH, POLYCARBONATE@ or ATRAFFIC SIGNAL, TWELVE INCH, POLYCARBONATE, LED OPTICS@and the number of Sections as required, the color and indication types, the name of the manufacturer, the date of manufacture, the pertinent Contract Number and the appropriate City Commodity Code Number.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1495  
BUREAU OF ELECTRICITY  
DEPARTMENT OF STREETS AND SANITATION  
CITY OF CHICAGO  
MARCH 20, 2000**

**TRAFFIC SIGNAL MOUNTING BRACKET  
POLYCARBONATE, SIDE OF POLE**

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**SCOPE**

1. This specification states the requirements for polycarbonate brackets designed for mounting 12 inch 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 fifteen (15) business days upon request of the Chief Procurement Officer. The sample must be delivered to the Engineer of Electricity, Bureau of Electricity, 2451 South Ashland Avenue, Chicago, Illinois 60608.
- (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 must warrant the signal bracket 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 three (3) years from date of acceptance. In the event defects and failures become apparent during this period, the

manufacturer must repair or replace such defects and 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 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 in the bracket (Tests may be performed on separately molded specimens).

<b><u>TEST</u></b>	<b><u>REQUIRED</u></b>	<b><u>METHOD</u></b>
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 must be glass impregnated between 30% and 40% 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 five degree 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 degrees 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 one (1) polycarbonate shim, 1/4" thick, one (1) 1-1/2" chase nipple with rubber

gasket, and one (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, plus or minus 1/4 inch.

### **WIRING SPACE**

7. The bracket must have an integral molded wireway with a minimum 1-1/2 inch diameter opening suitable for installation of multi-conductor cables.

### **DESIGN STRENGTH**

8. The bracket must be designed to support a 12 inch, single face, five-section, polycarbonate signal head with a 100 mile-per-hour wind.

### **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 discretion of the Commissioner. Final inspection must be made at point of delivery. Any bracket rejected must be removed and disposed of by the contractor at his sole cost.

### **PACKING**

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 three-eighths inch (3/8") 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.

THIS SPECIFICATION MUST NOT BE ALTERED

**ELECTRICAL SPECIFICATION 1528  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
REVISED MAY 1, 2004**

**PRECAST CONCRETE STRUCTURES**

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**SUBJECT**

1. This specification covers the requirements for precast concrete structures to be used as 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. Bidders must submit with their bids detailed scale drawings of the precast structures showing actual dimensions and details. 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.

Foundations must include conduit elbows, anchor rods, washers, and nuts. Handholes must include cable hooks. Manholes must include cable racks, pulling irons, and cable hooks. Frames and covers, sump grates, clay tile, and ground rods are not included under this specification.

- (b) Dimensions. Each manhole, handhole, and foundation 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. The precast 5 foot foundation is Standard Drawing 565.

- (c) Construction. 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.

#### **DELIVERY**

4. All manholes, handholes, and foundations will be delivered to the Division of Electrical Operations storage yard at 4101 South Cicero Avenue in Chicago, or to another location within the City as indicated on the order. 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.

**SPECIFICATION 1533  
BUREAU OF ELECTRICITY  
DEPARTMENT OF STREETS AND SANITATION  
CITY OF CHICAGO  
AUGUST 8, 2006**

**NON-METALLIC CONDUIT**

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**SCOPE**

1. This specification states the requirements for both rigid and coilable non-metallic conduit. The conduit will be used for low voltage (600 volt rated cables) electrical street lighting and traffic control systems. It may also be used for fiber-optic communications cables. This conduit will be installed underground. Rigid non-metallic conduit may be installed on structure.

**GENERAL**

2. (a) Standards. The following standards are referenced herein.  
  
ASTM – American Society for Testing and Materials  
NEC – National Electrical Code  
NEMA – National Electrical Manufacturer’s Association  
UL – Underwriter’s Laboratories
- (b) Warranty. The manufacturer must warrant the conduit against defective workmanship and material for a period of one year from date of installation or date of delivery. Any conduit that is found to be defective must be replaced without cost to the City.
- (c) Sample. If requested by the Chief Procurement Officer, a sample of the conduit intended to be furnished under this specification, must be submitted to the Engineer of Electricity within fifteen (15) business days upon receipt of such request.

**MATERIAL**

2. (a) Rigid non-metallic conduit will be made of polyvinyl chloride (PVC). All conduit and fittings must comply with ASTM D 1784 and with the applicable sections of NEMA TC2, UL standard 651, and NEC Article 347. Fittings must meet the standards of NEMA TC3 and TC6, as well as UL 514.
- (b) Coilable non-metallic conduit will be made of high density polyethylene (HDPE). All conduit must comply with ASTM D3485, ASTM D 1248, and

NEMA TC7.

### **SIZES**

3. (a) PVC and HDPE will come in two wall thicknesses; schedule 40 and schedule 80.
- (b) PVC will come in ten foot sections. HDPE will come on reels.
- (c) Nominal inside diameters ( in inches) for non-metallic conduits will include the following:  $\frac{1}{2}$  ,  $\frac{3}{4}$  , 1, 1  $\frac{1}{4}$ , 1  $\frac{1}{2}$  , 2, 2  $\frac{1}{2}$  , 3, 3  $\frac{1}{2}$ , 4.

### **PACKING**

4. Rigid conduit must be shipped in bundles. Coilable conduit must come on wooden reels. Both bundles and reels must be tagged to indicate the size and diameter of the conduit, the quantity in feet, the weight, and the manufacturer's name. The conduit itself must be marked to indicate the type and size, as well as the manufacturer.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1534**  
**BUREAU OF ELECTRICITY**  
**DEPARTMENT OF STREETS AND SANITATION**  
**CITY OF CHICAGO**  
**SEPTEMBER 25, 2006**

**CABLE: SINGLE-CONDUCTOR, COPPER 600 VOLT**

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**SUBJECT**

1. This specification states the requirements for cables intended to be used as conductors in 120/240 VAC, 60 cycle, single phase, street lighting circuits. The cables will be installed in underground ducts or conduit.

**GENERAL**

2. (a) Specifications. The cable must conform in detail to the requirements herein stated, and to the applicable portions of the latest revisions of the specifications and methods of test of the following agencies:
  - (1) ICEA Specification S-95-658
  - (2) IEEE Standard 383
  - (3) ASTM Standard E662-06
  - (4) ASTM Standard D470-05
  - (5) U.L. 44
  - (6) U.L. 854
- (b) Acceptance. Cable not in accordance with this specification will not be accepted.
- (c) Sample. If requested by the Chief Procurement Officer, a three (3) foot sample of the cable intended to be provided under this specification must be sent to the attention of the Engineer of Electricity within fifteen (15) days of receipt of such request.
- (d) Warranty. The manufacturer must warrant the cable to be first class material throughout. In lieu of other claims against them, if the cables are installed within twelve (12) months of date of shipment, the manufacturer must replace any cable failing during normal and proper use within two years of date of installation. All replacements under this warranty must be made free of charge F.O.B. delivery point of the original contract.

## **CONSTRUCTION**

3. This cable must consist of a round copper conductor with a tight fitting, free stripping, concentric layer of ethylene propylene (EPR) insulation and a concentric low lead chlorosulfonated polyethylene (CSPE) jacket extruded in tandem with, and bonded to, the insulation, or ethylene propylene (EPR) insulation only. The cable must be rated for continuous duty in wet or dry conditions at 90° C operating temperature, 130° C emergency overload temperature and 250° C short circuit temperature.

## **CONDUCTOR**

4. (a) **Material.** The conductor must either be soft or annealed round copper wire.
- (b) **Specifications.** The conductor must meet the requirements of ASTM B3, B8 or B258, as applicable.
- (c) **Sizes.** The conductor size must be as stated in the PROPOSAL and in accordance with all requirements in Table A of this specification.
- (d) **Stranding.** The number of strands, must be as indicted in Table A. Stranding must meet the requirements of ASTM B8, Class B.

## **INSULATION**

5. (a) **Type.** The insulation must be ethylene propylene rubber compound meeting the physical and electrical requirements specified herein.
- (b) **Thickness.** The insulation must be circular in cross-section, concentric to the conductor, and must have an average thickness not less than that set forth in Table A of this specification, and a spot thickness not less than ninety percent (90%) of the average thickness.
- (c) **Initial Physical Requirements:**
  1. Tensile strength, min., psi. 1,200
  2. Elongation at rupture, min. % 250
- (d) **Air Oven Exposure Test.** After conditioning in an air oven at 121 +/- 1°C for 168 hours using methods of test described in ASTM-D 573:

**Tensile strength, minimum percent of unaged value.....75**

**Elongation at rupture, minimum percent of unaged value.....75**

(e) Mechanical Water Absorption:

GRAVIMETRIC METHOD: After 168 hours in water at 70+/- 1°C:  
water absorption, maximum, milligrams per square inch.....5

(f) Cold Bend Test Requirements. The completed cable must pass the "Cold-Bend, Long-Time Voltage Test on Short Specimens" of ASTM D-470 except that the test temperature must be minus (-) 25°C.

(g) Electrical Requirements

1. Voltage Test. The completed cable must meet an A.C. and D.C. voltage test in accordance with ASTM D-470 and D-2655.

2. Insulation Resistance. The completed cable must have an insulation resistance constant of not less than 20,000 when tested in accordance with methods shown in ASTM D-470.

**JACKET**

6. (a) Type. If the cable is jacketed, the jacket must be a chlorosulfonated polyethylene (CSPE) compound meeting the physical and electrical requirements specified herein. The CSPE jacket must meet CFR Title 40, Part 261, for leachable lead.

(b) Thickness. The jacket must be circular in cross-section, concentric with the insulation, must have an average thickness not less than that set forth in Table A of this specification and a spot thickness not less than ninety percent (90%) of the average thickness.

(c) Initial Physical Requirements:

1. Tensile strength minimum PSI 1800
2. Elongation at rupture, minimum percent 300

(d) Air Oven Exposure Test. After conditioning in an air oven at 121 +/- 1°C for 168 hours:

1. Tensile strength, minimum percent of unaged value 75
2. Elongation at rupture, minimum percent of unaged value 60

(e) Mechanical Water Absorption. After 168 hours at 70 +/- 1°C:

1. Milligrams per square inch, maximum 20

## **TESTING**

7. (a) General. Tests must be performed on insulation, jacket and completed cables in accordance with applicable standards as listed in these specifications. Where standards are at variance with each other or with other portions of this specification, the most stringent requirements, as determined by an engineer from the Bureau of Electricity, will apply. All tests must be conducted on cable produced for this order. Where cable insulation and/or jacket thickness preclude obtaining samples of sufficient size for testing, special arrangements must be made with the engineer to obtain samples of unprocessed materials directly from the extrusion feed bins which will be separately processed and prepared for tests.
- (b) Number Of Tests. Insulation and jacket tests must be conducted on samples taken every 25,000 feet or fraction thereof of each conductor size. In no case must samples be taken closer than 15,000 feet apart.
- (c) Witness Tests. Where the quantity of cable on a single purchase order is 250,000 feet or more, all insulation and jacket tests must be witnessed by an engineer from the Bureau of Electricity, if so requested by the City. Included in these tests will be a 70,000 BTU per hour flame test in accordance with IEEE 383. Reels to be tested will be selected at random. The contractor must include in his bid, the cost of travel, food and lodging for one (1) engineer. Travel for 150 miles or greater must utilize a major airline. Lodging accommodations must be equal to those provided at a Holiday Inn. The engineer must be given ten (10) working days notice of all travel arrangements.
- (d) Test Reports. No cable may be shipped until certified copies of all factory tests, including witness tests where applicable, have been reviewed and approved by the engineer.
- (e) Acceptance. Samples must be taken from each reel and must successfully conform to all tests specified herein. Reels from which samples fail to conform, will be rejected.

## **PACKAGING**

8. (a) Cable Marking. The cable must be identified by a permanently inscribed legend in white lettering as follows:



1/c No. (conductor size) AWG-600V-90°C-EPR or EPR/CSPE

The legend must be repeated at approximately eighteen (18) inch intervals on the outside surface of the cable parallel to the longitudinal axis of the conductor. A sequential footage marking must be located on the opposite side from the legend.

- (b) All cable will be black pigmented. When three conductors (triplex) are specified, one conductor will be black, another will be red or black with a red tracer, the smaller of the conductors must have a green colored jacket and the three conductors must be triplexed with a 16"-18" lay. The insulation color must not be unduly affected by cable installation, or prolonged exposure to either direct sunlight or moisture. Where the quantity of triplex cable exceeds 80,000 feet, witness testing as outlined in section 7(c) will apply.
- (c) Reels. The completed cable must be delivered on sound substantial, non-returnable reels. Both ends of each length of cable must be properly sealed against the entrance of moisture and other foreign matter by the use of clamp-on cable caps, such as the Reliable Electric Company neoprene cable cap No. 1405, or equal. The ends must be securely fastened so as not to become loose in transit. Before shipment, all reels must be wrapped with cardboard or other approved wrapping.
- (d) Footage. Each reel must contain the length of cable as set forth in Table A of this specification. Alternate lengths may be considered.
- (e) Reel Marking. A metal tag must be securely attached to each reel indicating the reel number, contract number, date of shipment, gross and tare weights, description of the cable, the total footage, and the beginning and ending sequential footage numbers. Directions for unrolling the cable must be placed on the reel with an approved permanent marking material such as oil-based paint or a securely attached metal tag.

**TABLE "A"**

<b>CONDUCTOR</b>		<b>INSULATION/JACKET THICKNESS</b>		<b>A-C TEST</b>	<b>REEL LENGTH</b>
<b><u>AWG</u></b>	<b><u>STRANDS</u></b>	<b><u>MILS</u></b>	<b><u>MILS</u></b>	<b><u>VOLTS</u></b>	<b><u>FEET</u></b>
14	7	30	15	5500	2000
8	7	45	15	5500	2000
6	7	45	30	5500	2000
4	7	45	30	5500	2000
2	7	45	30	5500	1000
0	19	55	45	7000	1000
00	19	55	45	7000	1000
000	19	55	45	7000	1000
0000	19	55	45	7000	1000
250 MCM	37	65	65	8000	1000

**THIS SPECIFICATION MUST NOT BE ALTERED**

**ELECTRICAL SPECIFICATION 1545  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
REVISED JANUARY 28, 2010**

**PEDESTRIAN COUNTDOWN TRAFFIC SIGNAL  
LED, 16 INCH WITH SYMBOLIC WALK/DON'T WALK LENSES**

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**SUBJECT**

1. This specification states the requirements for a single section pedestrian countdown signal with light emitting diode (LED) symbolic messages on nominal sixteen inch by eighteen inch lenses 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 fifteen (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 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.
  - (d) Location. The supplier of the LED modules shall actively maintain an office,

stocking warehouse, and technical support within a 100 mile radius of the City of Chicago.

### **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 0.100 inches.

The polycarbonate formulation used must provide these physical properties in the housing (Tests may be performed on separately molded specimens).

<b><u>TEST</u></b>	<b><u>REQUIRED</u></b>	<b><u>METHOD</u></b>
Specific gravity	1.17 minimum	ASTM D 792
Vicat Softening temp	310-320° F	ASTM D 1525
Brittleness temp.	Below-200° 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, 1/8" thick) lbs./in.	12-16 ft.	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 five degree 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 degrees 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 2" pipe fittings and brackets.
- (d) Hinges. The housing must have four integral hinge lugs, with stainless steel hinge pins (AISI 304 or equivalent), located on the left side for mounting the door. The hinge pins must be straight and not protrude past the outside of the housing lugs. The housing must have two integral latching bolt lugs on the right side each with a stainless steel hinge pin to which a latching bolt (AISI 304 or equivalent), washer, and wing nut will be attached. The wing nuts must be captive.

- (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 (2) hinge lugs on the left side and two (2) sets of latch screw jaws centered on the right side, as viewed from the front of the signal, must be integrally cast with the housing door. The door must be hinged to the housing with two (2) stainless steel hinge pins, drive fitted. Two (2) stainless steel latch screws and wing 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 door must have four (4) holes with threaded metal inserts for stainless steel machine screws to secure the lens.

The inside of the door must be grooved to accommodate a one piece, air-cored EPDM (ethylene propylene diene monomer) gasket to provide a weatherproof and dust proof seal when the door is closed. The inside of the door must have four equally spaced threaded metal inserts for the lens attachment. The outside of the door must have an integral rim completely encircling the lens opening to prevent leakage between the door and the lens. The rim must have equally spaced tabs around the circumference with threaded metal inserts at 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 UNITS**

4. (a) Light emitting diode (LED) optical unit 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 standards for color (chromaticity) and brightness (luminance). During the required operating life of LED signal units, the luminance output of the units must not be less than 60 percent (.60) of the values specified in the standard.
- (c) Unit power supply must be constant current regulated and filtered to provide instant on indications, and to prevent momentary signal outages or flicker.
- (d) Units 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 two or more series strings of LEDs or in excess of twenty percent of 20% of LEDs are not operable.
- (g) Units must be fully operable over a range of 90 volts to 130 volts at 60 hertz, plus or minus 3 hertz.
- (h) Surge protection. Each unit must be provided with integral surge protection to withstand transient of 600 volt, 100 microsecond rise and 1 millisecond pulse width. The surge protector shall provide full electrical and physical protection to all unit components.
- (i) Maximum permissible power consumption at ambient conditions (nominal 120 volts, 60 hertz, 70 degrees F.) must be 18 watts at a minimum 90 percent power factor. Power consumed must not vary by more than ten (10) percent from nominal power consumption over voltage range of 105 volts to 125 volts, and over permissible environmental ranges.
- (j) Units must be fully operable at temperature ranges of -40 degrees F. (-40 deg C) to +165 degrees F. (+74 deg C) at up to 100 percent relative humidity.
- (k) Units shall be clearly marked on the back surface of the unit in a permanent manner showing information required for warranty and long term performance. Information to be shown must include manufacturer name, date of manufacture, electric power requirements, signal model type, and signal serial number.
- (l) The LED 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. In particular the LED unit shall be compatible with the NEMA TS-1 and later traffic signal load switches and conflict monitors.
- (m) Units shall meet applicable sections of Title 47, SubPart B, Section 15 of the Federal Communications Commission (FCC) rules as applies to electronic noise limitation and electromagnetic interference.
- (n) Total harmonic distortion (THD) induced into the voltage and current AC power line sine waves must not exceed 20 percent.

- (o) Burn-in. LED Optical units 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 be not less than nine and one-half inches (9 2") tall 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 9" high with proportional width and shall be compliant with latest ITE standards.
- (d) Lens. The unit lenses must be constructed of ultraviolet (UV) stabilized , impact resistant polycarbonate, acrylic or other approved material. Lenses must be anti-glare, smooth texture, and clear.

## **WIRING**

- 6. (a) Wire Leads. Each lamp connector must be furnished with three (3) leads color coded as follows:

White	-	Common
Red	-	"Don't Walk" Indication
Green	-	"Walk" Indication

The leads must be TEW, number 18 AWG, stranded copper wire with 2/64 inch thick, 600 volt, 105 degree C, thermoplastic insulation meeting MIL-W-76A specifications. The ends of the lamp leads must be stripped of one-half inch (2") 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 eleven foot (11') length of flexible electric cord, medium duty,

type SO, 3-conductor No. 16 AWG stranded copper, color coded, rubber insulated, neoprene jacketed, must be furnished with each pedestrian signal. Both ends of each cable length must be carefully stripped of six inches (6") of jacket and one inch (1") of insulation, and each conductor properly tinned.

### **COUNTDOWN FUNCTIONALITY**

7.
  - (a) The countdown 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.
  - (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 module must continuously monitor the traffic controller for any changes to the pedestrian phase time and re-program itself automatically as needed.
  - (d) The countdown module 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 module 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 module 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 Units shall be tested by a nationally recognized testing laboratory (NRTL), such as Intertek (ETL), to demonstrate compliance with the latest ITE VTCSH specification. All LED units shall have the testing laboratory's label attached.



- (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 and disposed of 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 three (3) years from date of acceptance. In addition, LED optical units must carry a seven (7) year warranty against failure or loss of color (chromicity) and signal brightness (luminance) below minimum acceptable PTCSI standard levels from date of final acceptance for contract construction, or date of delivery on a specific order. 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 three-eighths (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 ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
REVISED JUNE 1, 2009**

**ADVANCED TRANSPORTATION CONTROLLER AND CABINET  
WITH 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 will control traffic signal timing and sequencing at an intersection. The equipment will include a battery back-up system which will maintain power to the signals during a power failure.
- 1.2 If requested by the Chief Procurement Officer, within sixty (60) business days from receipt of notice, the contractor must provide a sample to the Division of Electrical Operations, 2451 South Ashland Avenue, Chicago, Illinois 60608. The sample must consist of the controller, cabinet, load switches, conflict monitor, batteries, and all appurtenant wiring and equipment completely assembled as a working unit. This sample must be regarded as a finished production sample and conformance or non-conformance to these specifications must be based on the sample submitted. No subsequent modifications to the production sample will be allowed. The sample must become the property of the City of Chicago with a suitable credit issued to the contract.
- 1.3 All tests as outlined herein must be regarded as minimum requirements. The contractor must submit his testing procedure for approval prior to performing any testing functions. Upon successful completion of all testing, certified test reports must be submitted for each unit. Units not successfully passing these tests or lacking proper documentation will be rejected. The manufacturer, or manufacturer's representative, must be available for shop testing at the City's facilities any equipment designed for railroad preemption for specific sites.
- 1.4 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)  
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) must 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 installation on moving parts, and for a period of five (5) years after installation on solid state devices. In the event of defects or failures during these periods, 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 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 must be an Advanced Transportation Controller (ATC) meeting the requirements of the specification “Advanced Transportation Controller (ATC) Standard Version 5.2b” dated June 26, 2006. The referenced specification is a joint effort of AASTHO, NEMA, and ITE. Since each user agency has different controller needs, for the City of Chicago the controller must meet the programming modifications and options listed in the ATC Matrix as indicated in Table A. All software necessary to make the controller operational must be included.
- 2.2 Power. The controller must operate on 120 volt, 60 cycle ( $\pm 3$  Hertz), single phase, alternating current. The controller must function in the range from 95 to 135 Volts a.c. The power consumed must be under 50VA.
- 2.3 Packing. Each controller, with all its component parts, must be suitably packed in a single container in such a manner as to prevent damage to the contents in shipment and handling.
- 2.4 Instructions. One (1) complete set of up to date instructions providing complete

information on installation, adjustment, operation and maintenance, including both up to date "Logic Schematics" and "Electronic Circuit" diagrams, of these controllers, must be furnished to the Division of Electrical Operations for approval prior to the first shipment of controllers. All information, including photos and schematics, must reference to the controller being furnished on this contract and must be a high quality, completely legible reproduction. Upon approval, one complete set of data must be furnished with each controller.

- 2.5 Training. The contractor must provide training at the City's facilities. The training must be on the actual equipment provided under the contract, and must include, but not be limited to, programming all features, connecting and wiring, and troubleshooting. Training manuals are required (training manuals should include the instructions in a teaching-type format). Training for up to five (5) City personnel is required.
- 2.6 Chassis. Aluminum construction with powder coat finish. No plastic chassis or composite chassis will be allowed. The controller must physically fit into existing 'M', 'P', and 'SUPER P' cabinets configured for City of Chicago applications, 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 - 16MB Flash
  - RAM - 16MB
  - SRAM - 1MB
- (All memory and firmware must be stored in flash memory. No EPROMS will be allowed.)
- 2.8 Display. 16 x 40 backlit LCD using a 6 x 8 character font. Display and keypad must be permanently attached to chassis. Detachable keypads will not be allowed.
- 2.9 Environmental. The controller must operate in the temperature range of -34 degrees Celsius to +74 degrees Celsius. The controller must operate within the relative humidity of 5% to 95%.
- 2.10 All printed circuit boards must be mounted vertically.
- 2.11 Encapsulation of 2 or more discrete components into circuit modules is prohibited except for transient suppression circuits, resistor networks, diode arrays, solid-state switches, optical isolators and transistor arrays. All encapsulated components must be second sourced and must be of such design, fabrication, nomenclature or other identification as to be purchased from a

wholesale distributor or from the component's manufacturer as a standard product. Custom encapsulated components are not allowed.

- 2.12 Obsolete components, components no longer supported by the manufacturer, components not recommended for new designs, components which have been discontinued or which the CONTRACTOR should have reasonably been expected to know were discontinued, or components which the vendor/manufacturer has announced plans to discontinue at the time of the bid must not be used in the design of any subassemblies provided under this contract.
- 2.13 The controller must meet the functional and environmental requirements of NEMA TS2 2003. The use of 2070s, 170s, BIUs, SIUs, or similar devices is not allowed.
- 2.14 As allowed by ATC v5.2b, Section 8.1.1, the controller will utilize NEMA 'A', 'B', and 'C' I/O connectors, except for the HMC-1000 and LMD40 I/O variants. Pin assignments for NEMA 'A', 'B', and 'C' connectors must follow the NEMA TS2 2003 standards for I/O. Port 2 must be the ATC v5.2b pin-limited version of NEMA TS2 Port 2. Port 3 must not be FSK, but should be TIA-574. Port 4 (C50S) must be a 9-pin connector with only limited signals being required.

Special function connector for the TS2-2 must follow the CPC style "D" pin outs as follows:

<i><b>CPC MSD Pin</b></i>	<i><b>Function</b></i>
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
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## 2.15 Downward compatibility with existing City of Chicago cabinets.

- (1) The controller must be of a modular design allowing for the ability to exchange I/O modules to allow for use in existing City of Chicago HMC-1000, LMD40, and standard NEMA TS2-2 cabinets. This I/O module must be “plug and play”. The controller’s firmware must detect the type of I/O installed (HMC-1000, LMD40 or NEMA TS2) and provide the proper user interface. Adapter harnesses for the HMC-1000, LMD40 and Setcon clock will not be allowed.
- (2) The HMC-1000 I/O module must be pinned as follows:

63 Pin Connector	Function
1	Output 20
2	Output 11
3	Manual Advance
4	Stop Time
5	Output 24
6	Offset 1
7	Offset 3
8	Output 15
9	Preempt 2
10	Advance
11	Output 23
12	Restart
13	Output 32
14	Offset 2
15	Output 16
16	Preempt 1
17	Output 25
18	Output 28
19	Spare 1
20	Spare 2
21	Output 7
22	Output 18
23	Output 21
24	Output 22
25	Dial 3

26	Dial 2
27	Output 1
28	Output 14
29	Output 4
30	Output 29
31	Output 27
32	Output 17
33	Output 9
34	Output 19
35	Dial 4
36	On-Line
37	Flashing Bus
38	Manual
39	Output 30
40	Output 31
41	Output 12
42	Output 10
43	Output 2
44	Output 3
45	Output 13
46	Output 8
47	Output 26
48	Logic Ground
49	Not Used
50	Not Used
51	Output 5
52	Output 6
53	Logic Ground
54	Logic Ground
55	Not Used
56	Not Used
57	Not Used
58	Not Used
59	24 V.D.C
60	Not Used
61	115 Volts AC
62	AC Neutral
63	Chassis Ground



- (3) The LMD40 I/O module contains 4 I/O connectors, MSA, MSB, MSD, and communications connectors which must be pinned as follows:

<b>LMD40 MSA</b>	<b>Pin</b>	<b>Voltage Level</b>
<b>Actuation 3</b>	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

<b>LMD40 MSB</b>	<b>Pin</b>	<b>Voltage</b>
<b>Output 25</b>	A	DC
Output 26	B	DC
Output 27	C	DC
Output 28	D	DC
<b>Output 29</b>	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

<b>LMD40 MSD</b>	<b>Pin</b>	<b>Voltage</b>
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

<b>LMD40 Communication Connector (15 pin sub-D)</b>	<b>PIN</b>	<b>Voltage</b>
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
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- (4) The Setcon I/O connector will be resident on the HMC1000 version of the ASTC I/O.

<b>Setcon Clock Connector</b>	<b>PIN</b>	<b>Voltage</b>
Output 1	1	DC
Output 2 (Dial 2)	2	DC
Output 3 (Dial 3)	3	DC
Output 4 (Dial 4)	4	DC
Output 5 (Offset 1)	5	DC
Output 6 (Offset 2)	6	DC
Output 7 (Offset 3)	7	DC
Output 8 (Flash)	8	DC
Sync Output	9	DC
Sync Input	10	DC
Not used	11	N/A
Logic Ground	12	DC
Not Used	13	N/A
Not Used	14	N/A
Not Used	15	N/A
Not Used	16	N/A

## 2.16 Communication.

- (1) NTCIP (National Transportation Communications for ITS Protocol).
  - a. The controller must be compliant with NTCIP Standards as outlined in NEMA TS2 – 2003 and must be tested and documented for compliance.
  - b. Global objects must be compliant to NTCIP 1201 v2.26 or later.
  - c. Actuated Signal Controller objects must be compliant to NTCIP 1202 v2.19f or later.
- (2) Serial ports, one of which must be set as either RS-232 or RS-485.
- (3) Ability to add an internal GPS module.
- (4) Ethernet. The controller must be equipped with a minimum of two front panel mounted 10/100Mb Ethernet ports.

- (5) A single port USB interface must be provided to facilitate database transfers, re-flashing of operation software and log transfer.
- (6) The unit must be fully compatible with, and fully functional within, the City's existing MIST system (Management Information System for Transportation). All available functions and capabilities that exist within existing MIST controllers must be available within this unit. Any additional software or hardware necessary to fully integrate the controller into the MIST system must be provided by the bidder and will be considered as part of the requirements of this specification.
- (7) A Windows based laptop utility software must be provided for data transfers and monitoring of controller operation.
- (8) A fiber-optic modem must be provided, if required. The modem must be compatible with existing City fiber interconnect systems. The modem may be internal or external to the controller.

#### 2.17 Software operation.

- (1) The controller must have the ability to re-synch a minimum of 8 cycle lengths to an "absolute zero" reference point. It must be possible to set absolute zero by either global command or individual cycle length.
- (2) In addition to hardwire input, it must be possible to set Absolute Zero via keyboard command or fiber optic communication.
- (3) The controller must have the ability to operate in two modes of operation, selectable by time of day:
  - a. Actuated control per NEMA TS2 – 2003.
  - b. Pretimed Interval based control per NEMA TS2 – 2003.
- (4) The controller must have the ability to transfer between actuated control and interval based control by time of day schedule.
- (5) The controller will have 32 Pre-timed plans
  - a. Each plan will allow for up to 32 timing intervals
  - b. Each plan will allow for 48 circuit outputs. Each output must be individually programmable per interval.
- (6) The controller must have 100 coordination plans.

(7) The controller must provide 6 preempts per NEMA TS2-2003.

(8) The controller will offer security as follows:

- a. Two 4 digit security codes can be programmed (one for timing data, one for signal plan data), which when activated, allow data changes. These codes must automatically de-activate 10 minutes after the last user keystroke. It will be possible to re-program the security codes if the previous security code is known or has been defeated.
- b. It will not be possible to read the security code from the controller's display.
- c. It will be possible to access the controller in the case of a lost security code through a "back door" which is provided only by the controller manufacturer. This "back door" security code must change based upon the controller's internal calendar.

2.18 Pre Shipment Testing. The manufacturer of the controller must perform at his manufacturing facilities a one hundred (100) hour burn-in test on every controller, conflict monitor unit, and appurtenant devices. This test period must be certified by the manufacturer with supportive documentation and must include the device serial number, dates and times of test periods, and results. Any failed, or nonconforming components must be replaced at this time. The 72 hour function test described in this specification, must be performed on each complete controller system. After each of the components has passed the burn-in test, they may be used in the assembly of the complete controller unit. Each completed unit must be subjected to the 72 hour function test as described in this specification. Should the controller fail to complete this test for any reason, the failed portion(s) of the unit must be replaced and the test repeated in its entirety. Certification of these tests must be attached to the outside of the shipping container. Any containers without this attached certification will be returned to the manufacturer at his sole expense. This certification is in addition to any other documentation and/or testing required by these specifications.

### **3. CONFLICT MONITOR**

3.1 General. Each controller must be furnished with a NEMA conflict monitor unit for checking for conflicts in the signal output circuits. The conflict monitor must be capable of monitoring a minimum of twelve (12) distinct channels. It must be a self-contained unit with its own power supply and not be located within the timer housing.

3.2 Programming Board. A removable programming board must be supplied with

the monitor for programming signal compatibility. The circuits for programming must be composed of soldered jumper wires. Diode or dip switch type programming will not be acceptable. The programming board must contain no circuitry or components other than the wire jumpers and the wire jumper soldering devices.

- 3.3 Flashing Circuit Energizing. The conflict monitor must be programmed to put the controller in a flashing sequence upon detection of a failure or conflicting signal display. The controller must also be programmed to energize the flash circuit if the conflict monitor is removed or loses its supply voltage. The conflict monitor must have a manual reset button to return the controller to normal operation after conflict circuit operation is no longer necessary.
- 3.4 Stop Time Circuit. A stop-time control circuit must be supplied from the conflict monitor to force the timer unit to stop timing upon detection of a conflict.
- 3.5 Indicator. The front panel of the conflict monitor housing must have an indicator which will be activated when a conflict or failure occurs as per Section 6 of NEMA Spec. TS1-1983.
- 3.6 Latch Circuit. The conflict monitor must have a latch circuit, insuring that if a voltage monitor failure occurs, the intersection remains in conflict until reset.
- 3.7 Memory. The conflict monitor must have the ability to store, in memory, a minimum of ninety-nine (99) conflict events, including date of conflict and channels conflicting.
- 3.8 Conflict Monitor Assignments

- (1) Conflict monitor channels must be assigned as follows:

Channel 1	Load Switch 1	Phase 1 Vehicle
Channel 2	Load Switch 2	Phase 2 Vehicle
Channel 3	Load Switch 3	Phase 3 Vehicle
Channel 4	Load Switch 4	Phase 4 Vehicle
Channel 5	Load Switch 5	Phase 5 Vehicle
Channel 6	Load Switch 6	Phase 6 Vehicle
Channel 7	Load Switch 7	Phase 7 Vehicle
Channel 8	Load Switch 8	Phase 8 Vehicle
Channel 2W	Load Switch 9	Phase 2 Ped
Channel 4W	Load Switch 10	Phase 4 Ped
Channel 6W	Load Switch 11	Phase 6 Ped
Channel 8W	Load Switch 12	Phase 8 Ped



Channel 9	Load Switch 13	Overlap A
Channel 10	Load Switch 14	Overlap B
Channel 11	Load Switch 15	Overlap C
Channel 12	Load Switch 16	Overlap D

- (2) It must be possible for the user to change conflict assignments without unsoldering any connections.
- (3) All unused channels - vehicle or pedestrian - must be neatly tied or terminal mounted in such a manner that they are readily available in front of the panel. If tied, the harness wires must be labeled. If terminal mounted, the terminations must be labeled.
- (4) A terminal must be provided for the red enable feature.
- (5) A terminal must be provided for the hook up of any unused red channels to AC.
- (6) Controller monitoring must consist of; voltage monitor, 24VDC- I, 24VDC-II.
- (7) The output relay must operate a sixty (60) ampere, normally open, "A" type mercury contactor without the use of an external or "cabinet interface" relay.

#### **4. SUPER P CABINET**

- 4.1 Housing. Each controller must be furnished completely housed in a Type 5052-H32 aluminum housing of 0.125 inch thickness. The exterior dimensions of the cabinet must be 57 inches high, 57.625 inches wide, and 26.241 inches deep. The top of the cabinet must be 57.925 inches wide and 28.7 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 must 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 must 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. The cabinet manufacturer will be Erpel, Hennessy, Southern Manufacturing Company, or approved equals.

- 4.2 Doors. The cabinet must 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 in this order.

Opening of the main door must provide complete access to the cabinet interior. The door must be embossed, subject to approval, with the legend "CITY OF CHICAGO-TRAFFIC CONTROL" in letters at least one (1) inch high. The 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 must 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 must be provided with a mounting assembly to hold the forced air fan system. A fan, having a minimum air movement capacity of 100 CFM, must be mounted in the air baffle in the top of the cabinet with an air outlet built into the roof overhang. The main door must be louvered and equipped with a removable, standard, commercially available aluminum dust filter. The battery compartment must 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 must contain a vertically adjustable shelf large enough to accept the solid state controller and all other shelf mounted devices. The battery

compartment must have a minimum of three shelves.

- 4.5 Bolt Pattern The bolt pattern must 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, and either be City of Chicago green color No. 14110 or gloss black color. Exterior color must be as defined in the PROPOSAL or Contract Plans, and color samples must be submitted for approval prior to acceptance of cabinet. Cabinet interior must be glossy white and may be either baked enamel or thermosetting, polyester powder coat. For either process, the interior must be prepared as described above. If the baked enamel finish is used, it must be preceded by one (1) coat of primer.

## **5. POWER SUPPLY**

- 5.1 A sixty (60) ampere main breaker must be inserted in series with the line.
- 5.2 An unfused terminal bus must be provided for ground side of the power supply and signal conductor commons.
- 5.3 Individual circuit breakers must be supplied for: (a) AC+ lights, 50 amperes; (b) AC+ control, 10 amperes; (c) duplex outlet supply, 15 amperes.
- 5.4 The incoming line must contain lightning protection devices consisting of, but not limited to, a metal oxide varistor and gas type arrestor. The gas type arrestor must be on the line side of the radio interference filter.
- 5.5 Contactor. A sixty (60) ampere Magnacraft, or approved equivalent, normally open, "A" type mercury contactor must be supplied for opening and closing the AC supply to the signal bus. This contactor must be mounted in such a manner on the power supply panel that accidental contact does not produce a safety hazard.

- 5.6 R.I.S. Filter. A radio interference suppression filter rated at sixty (60) amperes minimum must be installed in line with the main power supply, after the sixty (60) ampere circuit breaker.
- 5.7 Ground. The grounded side of the power supply must be continuous throughout the controller and must be grounded to the controller cabinet in an approved manner meeting OSHA requirements.
- 5.8 Polarity. The phase conductors of the signal circuits must have the same polarity as the phase side of the power supply, and the common conductor(s) must be of the same polarity as the grounded side of the power supply.

## **6. UNINTERRUPTIBLE POWER SUPPLY**

- 6.1 General. The uninterruptible power supply 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 U.S. Traffic Corporation, On-Line Power, Inc., or an approved equal.

### 6.2 General Operation

- (1) The line power provided by ComEd is nominally 120 volt, single phase, 60 Hertz. The UPS system will take the line power, regulate it, and provide continuous 120 volt, single phase, 60 hertz power to the traffic system. The UPS will regulate the input line voltage within the limits specified herein. The input line voltage will also be transformed and rectified to charge the batteries. Under battery operation, the output from the batteries will go through an inverter 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 will 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 must also be provided. The system must 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 must be in ASCII formats and must not require any external or proprietary software. The DB-9 connector for the RS-232 interface must 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 must 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 must be programmable. The default values should be 105VAC and 125VAC. This time must 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 must 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 must be rated at 240 volts, 40 amps.
- (5) The UPS must 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 must be located in the cabinet near the batteries.
- (6) The charger must 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( $\pm 3$  Hz).
- (8) The UPS must 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 must have a lightning surge protection in compliance with IEEE/ ANSI C.62.41 for 2000 volts AC.
- (10) The UPS must not weigh more than 50 pounds.
- (11) The UPS must have a minimum efficiency of 95%.
- (12) The generator bypass switch must be supplied with a 30 amp, weather-proof locking receptacle and cover plate.

#### 6.4 Computer Control and Display

- (1) The UPS must include an LCD display with programmable keypad, a red LED and a green LED, and an RS-232 interface.
- (2) The UPS processor must 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 must provide a temperature control for the cabinet fan.
- (4) The UPS must be provided with a resettable inverter event counter and a cumulative inverter timer.
- (5) The UPS must be equipped with an event log for a minimum of 100 events. Each event must have a date and time.
- (6) The UPS must be capable of performing a self-test.
- (7) Password protection must be provided.
- (8) The following LED conditions must 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 must be 12 volt, and must be commercially available and easily replaced.
- (2) Four 79ah batteries must be supplied.
- (3) The batteries will be connected in series. The wiring harness must be color coded with quick disconnects.
- (4) Batteries must be certified to operate over a temperature range of -25° C. to +74° C.
- (5) The batteries must 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 must be supplied to keep battery operation efficient.

## 6.6 Relay Contacts

- (1) The UPS must provide 6 sets of panel-mounted, potential free, fully programmable relay contacts rated at 1 amp, 120 volt. The relays must be numbered from C1 to C6.
- (2) Each relay must 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 to 100%.

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 must be provided for mounting the load switch jacks, flash transfer relay jacks, flasher jack, auxiliary relays, time clock jacks, switches, flash change combination terminals, and terminals for field signal connections under non-interconnected operation. See 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 must be capable of carrying fifteen (15) amperes continuously at a temperature of 165° F. (74° C.).

7.4 Bus Feeds. Bus feeds must 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 must include, but not be limited to, the following:

- (1) Ten (10) ampere fuses with barrier type fuse holders must be installed between the load switch signal output circuits and field terminals for signal light conductors. Each terminal must be the barrier type with sufficiently long screws to accept four (4) #12 AWG solid conductors. The terminals must be located at least two inches (2") above the bottom of the cabinet.
- (2) Switching Device. The signal load switching device must be a three (3) circuit, solid state, jack mounted load switch which meets the N.E.M.A. Publication TS-1, Part 5 requirements. Each load switch must be rated for a minimum fifteen (15) ampere continuous resistive load and must mate with an S-2412-SB panel socket. A minimum of twelve (12) and a maximum of sixteen (16) load switches to be provided with each cabinet, as defined in the PROPOSAL or Contract Plans.
- (3) User Programmable Interface. Two (2) sets of terminal blocks must be



provided between the machine logic output and the input side of the load switches. By terminating all machine logic output on one set of terminals and all load switch input to the other set, an interface is thus created by which the machine logic can be readily connected to any of the load switches by means of a jumper wire. The two (2) sets of terminal blocks must be conveniently located in close proximity to each other and must be arranged such that, initially, each function will be factory wired directly from one set of terminals to the other without the need to criss-cross wires between blocks.

(4) Number of Signal Circuits:

- a. Sixteen (16) load bay panel. Each panel must be equipped with sixteen (16) load switch jacks for a minimum of forty-eight (48) signal circuits.
- b. All unused signal circuits must be neatly tied or terminated. If tied, the harness wire must be labeled. If terminated, each termination must be identified.

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 must be mounted on a type P-406-SB plug which will mate with an S-406-SB socket on the controller panel. The flasher must utilize zero-point switching, with turn-on at the zero voltage point ( $\pm 5$  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 must provide two (2) output circuits to permit alternate flashing of signal phases and must be capable of carrying a minimum of twenty (20) amperes per circuit at 120 volts. The flasher must operate continuously so that flashing power will be available at the field terminal marked "FL". The flasher wiring must divide the loads imposed on the two (2) circuit flasher alternately on each phase.

8.4 Manual Flash. A manual flash switch must provide flashing indication for all circuits. The flash change combination terminals must allow the selection of flashing either yellow or red on the main and/or cross streets, or complete

omission of the flashing feature if required.

## **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 PROPOSAL. It must be of an approved weatherproof construction with a six (6) foot, retractable, flexible, extension cord to allow connection to the appropriate terminals on the panel of the controller. It must 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 must be furnished with each controller. These relays must be jack mounted into an S-408-SB, or equivalent, socket mounted on the controller panel.
- 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 ("MIDTEX", Model 158-92T200 or equal).

## **11. COMMUNICATIONS INTERFACE PANEL**

- 11.1 Where a communications interface has been specified in the PROPOSAL or contract plans to allow a controller to function as a Master or Secondary controller, then one of the specified options must be provided:

- (1) Fiber Optic Communications Interfaces must meet the following requirements:
  - a. General. The fiber optic communications components must consist of, but not be limited to, an internal fiber optic modem within the controller or an external fiber optic modem, a fiber optic patch panel to interface the modem to field fiber optic cables, and fiber optic jumpers between the modem and patch panel.
  - b. The modem must either be a multi-directional "star" type or a bi-directional type, as specified in the PROPOSAL or contract plans. All modems must be Electronic Industries Association (EIA) compatible for RS-232 data communications via fiber optic link. Modems must be multi-mode, operate at 850nm wavelength, and provide full-duplex, frequency modulated, asynchronous transmission at data rates of up to 38.4 kbps.
  - c. The fiber optic patch panel must consist of a 14" long by 5-3/4" wide by 3-1/4" high rack constructed in accordance with City of Chicago 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 an VAC input activates a relay sending an input from that relay to the controller. It must have a minimum of seven (7) relays for the following functions; Dial 2, Dial 3, Dial 4, Offset 1, Offset 2, Offset 3, M.U.T.C.D. flash.
  - c. The master interconnect panel must provide a means to establish outgoing VAC for a seven (7) wire interconnect system using eight (8) relays. The relays must have 24 VDC coils and be designated as, Dial 2, Dial 3, Dial 4, Sync, Offset 1, Offset 2, Offset 3, M.U.T.C.D. flash. The sync relay must be wired in such a manner that it provides the offset pulse to the contacts of the three (3) Offset relays.
  - d. Each relay must be a double pole type, with one pole designated as field interconnect output, and the other designated as controller input. Relay coils must be rated for continuous duty. Relay contacts must be rated for a continuous fifteen (15) AMP resistive load.
  - e. A terminal strip must be mounted on the top of the master interconnect panel for controller interface.
  - f. The master panel must interface with the T.B.C. terminals as described above.
  - g. Each output must be fused as outlined above.

## 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, 2007. 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. In addition to the testing required in the ATC standard, the following test requirements must be utilized:
- 14.2 N.E.M.A. Environmental Test. One controller, the submitted sample unless approved otherwise, must be tested, at the manufacturer's expense, in accordance with Part 2 of NEMA Standards Publication TS1-1983. All of the tests listed must be performed with all data properly recorded and certified. If the manufacturer changes the design, fabrication or components of a previously

tested and approved controller, then a sample of the controller containing the new design, fabrication or components must be retested at the manufacturer's expense. Any N.E.M.A. environmental test references to minimum recall must include but not be limited to: All forty-eight (48) output circuits must be programmed in a sequence to simulate the normal functioning of the entire controller cabinet assembly; The conflict monitor must have a test board with the allowable channel jumpers installed to simulate normal operation; All thirty-two (32) intervals must be programmed with a minimum of two (2) seconds per interval.

- 14.3 Functional "Burn In" Testing. The "burn in" requirement must include a test that uses all forty-eight (48) output circuits in "solid" burn as well as 1 pps and 5 pps for each circuit. All thirty-two (32) intervals must be programmed with a minimum of two (2) seconds per interval. The documentation for a test program to simulate the 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.
- 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 prior to shipment from the factory. The manufacturer must submit five (5) copies of his proposed "Test Procedure Document" for approval with the sample requested above. The test procedure must consist of two (2) sections; physical inspection and functional testing. If the test procedure is judged by the Commissioner or his duly authorized representative to be incomplete, inadequate or otherwise deficient, the contractor must revise and resubmit his "test procedure document" until it is approved. No contract can be awarded until the "test procedure document" has been approved.
- 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 Performance Testing Documentation. Upon completion of the performance testing, two (2) certified copies of the final results of the approved "Test Procedure Document" must be included with all traffic signal controller production shipments.
- 14.7 Testing, Certification and Observation. Each traffic signal controller ordered must be tested in accordance with the approved "Test Procedure" document. The City's representative(s) must observe the manufacturer's testing in progress. The City must be notified at least thirty (30) calendar days prior to testing, and no testing will be initiated without the presence of its representative(s). The representative(s) may observe all, or a portion, of the tests, as he (they) may deem necessary. Certification documents that the traffic signal controller has been tested in accordance with the Test Procedures documents, and the results of these tests, must be signed by the individual(s) performing the tests and their immediate engineering supervisor. Two (2) copies of each certification document must be delivered with each production traffic signal controller. The contractor must include in his bid the cost of travel, food and lodging for two (2) engineers. Travel for 150 miles or greater must utilize a major airline. Lodging accommodations must be equal to those provided at a Holiday Inn.
- 14.8 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.
- 14.9 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.  
Generator Hook-up.

## **15. SHIPMENT AND DELIVERY**

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.

## **16. INSPECTION**

16.1 An inspector representing the City must have free entry at all times, while the work on the contract is being performed, to all parts of the manufacturer's plant which concern the manufacture of the equipment. The manufacturer must afford the inspector, without charge, all reasonable facilities to satisfy the inspector that the equipment is being furnished in accord with these specifications.

## CHICAGO ATC MATRIX - TABLE A

Since the ATC standard specifies a “family” of controllers, the following options have been selected from the ATC standard to meet the City’s needs.

Functional Requirement	ATC Clause #	Status	Details
Shelf Mounted	2.2.1 4.3.2.1	Required	(Shelf mount only)
Use of ATC Engine Board	2.2.2 4.3.2.2 5.1.1 5.1.2 5.3.2 5.3.4 5.3.5 5.3.5.1 5.4.2 5.4.3 5.4.4 5.4.5	Required	
Use of ATC Engine Board	5.2.1	Required	<ul style="list-style-type: none"> <li>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</li> </ul>
Use of ATC Engine Board	5.2.2 5.4.5	Required	<p>In order to show the Ethernet communications to the Engine Board, the following “Reserved” pins can assume the following legacy functions:</p> <ul style="list-style-type: none"> <li>P1-34: ENET2 Speed</li> <li>P1-35: ENET2 Link/Activity</li> <li>P1-36: ENET1 Speed</li> <li>P1-37: ENET1 Link/Activity</li> </ul>
Use of ATC Engine Board	5.3.1	Required	Minimum CPU capability of 500 MIPS
Use of ATC Engine Board	5.3.3	Required	Additionally, must provide a minimum of 16 MB of Flash total to accommodate future applications.

Use of ATC Engine Board	5.4.1	Required	<ul style="list-style-type: none"> <li>Engine Board shall not draw more than 4W of power from VPRIMARY (due to battery backup in Chicago)</li> <li>Engine <b>may</b> supplement VSTANDBY_5 with on-board storage for its standby power.</li> </ul>
Use of ATC Engine Board	5.4.3	Required	<ul style="list-style-type: none"> <li>All optional baud rates shall be supported</li> </ul>
Modem Slot	2.2.3 4.3.2.3 6.1 6.1.1 6.1.2 6.2.2 6.3.1.3	Required	<ul style="list-style-type: none"> <li>Only one modem slot to be provided (due to space restrictions) and not labeled</li> <li>Reduced modem slot pin-out</li> <li>+12VDC ISO and DCGND2 are not required to be supported</li> </ul>
Modem Slot	6.2.1 6.3.1 6.3.1.1 6.3.1.2 6.3.1.5	Required	<ul style="list-style-type: none"> <li></li> </ul>
Parallel I/O	2.2.4	Required	<ul style="list-style-type: none"> <li>No support required for TS2 Type 1 or ITS cabinets</li> <li>Must provide parallel I/O for TS2 Type 2 cabinets and legacy parallel I/O interfaces via interchangeable modules</li> </ul>
Linux O/S and ATC BSP	2.2.5 4.3.1 4.3.3	Required	
Linux O/S and ATC BSP	2.2.5 4.3.1 4.3.3	Required	
Linux Kernel	Annex A	Required	
Parallel I/O	3.4	Required	Not required to support ITS Cabinet standard (NEMA cabinets are used)
Manage Clock/Calendar functions and synchronize with external source	3.5.1.3	Required	Must also support synchronization with absolute zero.

Manage Clock / Calendar functions and synchronize with External Source	4.1.3	Required	<ul style="list-style-type: none"> <li>BSP RTC driver shall automatically update the RTC with the OST time once per second with an accuracy of 0.1 seconds</li> <li>Successive interruptions (e.g. on for 5 minutes, off for 3 minutes over a period of 8 hours) shall not introduce cumulative error</li> </ul>
Configure and Verify Parameters	3.5.1.4 4.1.4	Required	
Upload/Download blocks of data	3.5.1.5 4.1.5	Required	
Monitor & Verify Application Status	3.5.1.6 4.1.6	Required	
Operator Control of Application Execution	3.5.1.7	Required	<u>Only</u> a local operator is allowed to manage the starting, stopping and scheduling of one or more applications on the ATC.
Operator Control of Application Execution	4.1.7	Required	
Long Term Storage of Log Data, etc	3.5.1.8 4.1.8	Required	
Support Diagnostics	3.5.3.3 4.3.4	Required	
Modes of Operation	3.7	Required	(Must support Standalone, Direct, and Distributed modes of operation)
Manage/Control a Variety of External Devices	4.2.1	Required	<ul style="list-style-type: none"> <li>Fixed Ports on the front panel shall be specified by the City</li> <li>Only SP1 and SP2 are required to be supported on the modem slot</li> <li>The dedicated synchronous serial port (SP5) is to be used exclusively for supporting a parallel I/O module (NEMA TS2 or legacy interface)</li> </ul>
Monitor the Status of External Devices	4.2.2	Required	<ul style="list-style-type: none"> <li>Fixed Ports on the front panel shall be specified by the City</li> <li>Only SP1 and SP2 and required to be supported on the modem slot</li> <li>The dedicated synchronous</li> </ul>

			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 (9-pin) and be labeled "Port 2".
Front Panel Serial Ports	6.2.3.1 6.3.2.1	Required	One serial port shall satisfy this section as an EIA-574 (9-pin) with a reduced pin-out (TXD, RXD, and DC Reference at a minimum) and be labeled "C50S". C50_ENABLE shall not be supported. A second serial port shall fully satisfy this section as an EIA-574 (9-pin) and be labeled Port 3.
Front Panel Serial Ports	6.2.3.2 6.1.3 6.3.2.2	Required	One serial port shall satisfy this section as an EIA-485 (15-pin) with the TS2 Type 1 Port 1 pin-out and be labeled "Port 1".
Front Panel Ethernet Ports	6.2.3.9 6.3.2.9 7.1.4.4	Required	There shall be a minimum of two Ethernet ports on the Front Panel (one for ENET1, one for ENET2)
User Interface	7.1 7.1.1.2 7.1.4.4 7.1.4.5 7.1.4.7	Required	(See "Port 2" under "Front Panel Serial Ports")
User Interface	7.1.1	Required	Must meet City's Minimum requirements
User Interface	7.1.1.1 7.1.2.1 7.1.3 7.1.4.1 7.1.5	Required	<ul style="list-style-type: none"> <li>• Data key is not required</li> <li>• Front Panel Interface is to be integral to the controller (i.e. not removable, no SP6 connector)</li> <li>• "Option 1" to be selected but AUX switch is optional</li> <li>• Keypad shall have a minimum of 24 keys</li> <li>• LCD Display shall be graphical with a minimum resolution of</li> </ul>



			<p>128 rows x 240 columns (up to 16 lines x 40 characters).</p> <ul style="list-style-type: none"> <li>• 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</li> <li>• Refresh rate is a minimum of 10 times per second (due to larger display requirements)</li> <li>• 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).</li> <li>• Heater Power shall be up to 15W at 1A current maximum</li> </ul>
Power Supply	7.2 7.2.1 7.2.2 7.2.3 7.2.4 7.2.5 7.2.5.1 7.2.5.2 7.2.6.1 7.2.6.2 7.2.6.3 7.2.6.4 7.2.6.6	Required	As applicable for NEMA cabinets only
Power Supply	7.2.6 7.2.6.5	Required	<ul style="list-style-type: none"> <li>• Optional Display (LCD) Heater is required</li> <li>• 24VDC, 12VDC, and -12VDC shall also satisfy the holdup time requirements within their respective output specifications</li> </ul>
Mechanical/Chassis	7.3.1.3	Required	<ul style="list-style-type: none"> <li>• Only Shelf mounted units are</li> </ul>

	7.3.1.4		<p>acceptable</p> <ul style="list-style-type: none"> <li>Only components / connectors specified by the City shall be located on either the Front or Rear panels. No C1 Type Connectors allowed.</li> </ul>
I/O Interfaces	8.1.1 8.2.2 8.2.2.1 8.2.2.2 8.2.2.3 8.2.2.4 8.4 8.4.1 8.4.2 8.4.3 8.5	Required	<ul style="list-style-type: none"> <li>Support for TS2 Type 2 and TS1 Interfaces</li> <li>Only provided Ethernet ports shall be subject to ESD requirements</li> </ul>
I/O Interfaces	8.1.2 8.2.2.5	Required	<ul style="list-style-type: none"> <li>Support is only required for NEMA TS2 Type 2, TS1, and other similar legacy interfaces</li> <li>NEMA TS2 Port 1 shall also be provided (for detectors only)</li> </ul>
I/O Interfaces	8.2.3	Required	Port 1 Connector shall be provided as specified within this section (only used for detectors)
I/O Interfaces	8.2.1.13	Required	Legacy I/O interfaces shall respond as required.
I/O Interfaces not required	8.2.1	Required	<ul style="list-style-type: none"> <li>No support for Model 332 Cabinets or ITS Cabinets &amp; devices is to be provided</li> </ul>
Serial I/O	8.3	Required	<ul style="list-style-type: none"> <li>Only two Ethernet ports are required and they shall be located on the Front Panel (one for ENET1, one for ENET2)</li> <li>If Hub1 is provided, it shall have <b>three</b> external RJ-45 jacks and also connect to the Modem slot along with ENET1 on the Engine Board</li> <li>Hub2 is not required</li> <li>Serial Port Usage is as follows:</li> </ul>

			<ul style="list-style-type: none"> <li>○ SP1: Modem Slot &amp; NEMA Port 3 (front) as TIA-574 instead of FSK</li> <li>○ SP2: Modem Slot</li> <li>○ SP3: TS2 Port 1</li> <li>○ SP5: TS2 Parallel I/O</li> <li>○ SP6: Integrated User Interface (i.e. no external connector)</li> <li>○ SP8: EIA-574 (front) as TS2 Port 2 (but with ATC v5.2b limited pins)</li> <li>○ SPI: No external interface</li> <li>○ USB: USB port (front)</li> <li>○ ENET1: At least 1 RJ45</li> <li>○ ENET2: At least 1 RJ45</li> </ul>
Environmental & Test Procedures	9	Required	All subsections are required
Performance & Material Requirements	10	Required	All subsections are required
Performance & Material Requirements	10.1.15	Required	All PCBs and similar construction mechanisms shall be mounted vertically (i.e. no horizontal PCBs are allowed).
Quality Control	11	Required	All subsections are required

**ELECTRICAL SPECIFICATION 1584  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
JANUARY 14, 2014**

**LUMINAIRE: COBRA-HEAD, ARTERIAL,  
LED (400 WATT LAMP HPS EQUIVALENT), IES CUTOFF  
TYPE II/III DISTRIBUTION**

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**SUBJECT**

1. This specification states the requirements for an LED street lighting luminaire with driver. The luminaire shall be equivalent to a luminaire with a 400 watt HPS lamp and an IES Type II/III medium cutoff distribution. The overall shape of the luminaire shall be the cobra-head as presently used by the City for arterial streets.

**GENERAL**

2. (a) Information Required. Each bidder shall submit with his proposal the following information relative to the luminaire he proposes to furnish:
  1. Outline drawing.
  2. Complete description and weight.
  3. Candlepower distribution curve showing the light distribution in the 70° degree cone and in a vertical plane through the maximum beam.
  4. Isolux curves.
  5. Utilization efficiency charts.
  6. Luminaire efficiency.
  7. Projected area in square feet.
  8. Manufacturer's name and catalogue designation of the luminaire.
  13. IES formatted photometric curve in electronic format.
- (b) Sample. One completely assembled luminaire of the manufacture intended to be furnished, must be submitted upon request of the Chief Procurement Officer within fifteen (15) business days of such request.
- (c) Assembly. Each luminaire must be delivered completely assembled, wired, and ready for installation. It must consist of aluminum die-cast housing, LED arrays, tempered glass refractor, terminal block, driver-door panel, electronic driver, gaskets, slip fitter, photocontrol receptacle (if required) and

all necessary hardware.

- (d) Warranty. The manufacturer shall warrant the performance and construction of these 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 manufacture as indicated on the luminaire. A reduction of lighting output of more than 10% within the ten years will constitute luminaire failure. Any luminaire or part thereof, not performing as required, or developing defects within this period must be replaced by the manufacturer without expense to the City.
- (e) Organizations. The following organizations' specifications are mentioned herein.

ANSI – American National Standards Institute

ASTM – American Society for Testing and Materials

IEC – International Electrotechnical Commission

UL – Underwriters Laboratories

IESNA – Illuminating Engineering Society of North America

### **CONSTRUCTION**

- 3. (a) Weight and Area. The net weight of this luminaire must not be more than 46 pounds. The effective projected area (EPA) must not exceed 1.0 square feet.
- (b) Housing. The housing shall be a precision aluminum die-casting composed of aluminum meeting ASTM Specification A380. It must be substantial and adequate enough to withstand the strains likely to be imposed on the housing when installed and in service. The housing must enclose the slipfitter, LED arrays, glass refractor, photocontrol receptacle, terminal board, and the electronic driver, with provision for proper mounting of these parts. The housing must have provision on its top surface to permit leveling with a spirit level. The housing must have integral heat sink characteristics, such that all enclosed components will operate within their designed operating temperatures under expected service conditions. No extra items shall be installed as heat shields or heat sinks. All heat shields and heat sinks shall be integral to the luminaire. The housing will have an appearance similar to existing cobra-head housings typically in use on Chicago's arterial streets.
- (c) Slip Fitter. The slip fitter shall be suitable for attachment over the end of a two (2) inch steel pipe with an approved means of clamping it firmly in place, and must provide a cast-in pipe-stop. It may be integral with, or may be attached to, the housing. The slip fitter must be designed to permit

adjustment of not less than five (5) degrees above and below the axis of the mounting bracket. The slip fitter must contain an approved shield around the pipe entrance to block entry of birds.

- (d) Refractor. The refractor shall be crystal clear, heat-resistant, tempered glass, well annealed, homogeneous, and free from imperfections and striations. It must be flat.
- (e) Refractor Holder. The refractor holder must be die cast of aluminum alloy A380. The refractor must be securely held in the refractor holder with a number of stainless steel screws.
- (f) Driver Door-Panel. The driver components must be completely assembled and mounted on a die-cast aluminum door-panel composed of aluminum alloy A380. The door-panel must be hinged to the luminaire housing, suitably latched and fastened at the closing end. It must be made to be removed easily. The hinge and fastening devices must be captive parts which will not become disengaged from the door panel. An adhesive backed vinyl-impregnated cloth marker with an ID designation in 2" high black numbers on a red/white background must be attached to the door. The marker must be identifiable from the ground when the luminaire is mounted at a height of 30 feet.
- (g) Gaskets. Wherever necessary, in order to make a completely dustproof optical assembly, gaskets of silicone rubber or other specifically approved material must be provided. The reflector gasket must fit around and over the flange of the reflector.
- (h) Hardware. All machine screws, locknuts, pins and set screws necessary to make a firm assembly, and for its secure attachment to the mast arm, must be furnished in place. All hardware must be of stainless steel, copper silicon alloy or other non-corrosive metal, and where necessary must be suitably plated to prevent electrolytic action by contact with aluminum.
- (i) Finish. The luminaire shall have a polyester powder coat with a minimum 2.0 mil thickness. Surface texture and paint quality will be subject to approval. Color must be gloss black or gray Munsell No. 5BG 7.0/0.4 (designated A.S.A. No. 70) as specified in the order. A paint chip must be submitted as a sample upon request.
- (j) Ingress Protection. The luminaire shall have an ingress protection rating of IP65 or better as described in IEC standard 60529 (also ANSI C136.25-2009).
- (k) The luminaire shall be UL listed. It shall be suitable for wet locations per UL 1598.

- (l) The luminaire shall be rated to operate between -40° to +50° Centigrade.
- (m) The luminaire shall have the option of adding a house side shield.
- (n) A bar code with pertinent information for warranty and maintenance shall be attached to the inside of the housing. A separate bar code label shall be on the inside of the driver door.

## **ELECTRICAL COMPONENTS**

- 4. (a) LED Optical Array. 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. The LEDs shall deliver a minimum of 70% of initial lumen output at 50,000 hours. LEDs shall provide a color rendition index (CRI) of 70. The color temperature of the LEDs shall be 4000 degrees Kelvin. The optical unit shall have an IP66 rating.
- (b) Terminal Block. A divisible-type terminal block of molded phenolic plastic must be provided within the housing in a readily accessible location on the main housing mounted directly over the driver door. It must be easily accessible when opening the driver door. The terminal block must be rated for 600 volts and must provide the terminals needed to completely prewire all luminaire components. The terminal block must be connected to a quick disconnect so that power to all components can be removed. The terminal block will have plated copper or plated brass, clamp-type pressure terminals of an approved type which will accommodate an incoming wire size of #12 AWG. The terminals for connection of the incoming wiring must be the polarized quick disconnect type.
- (c) Driver Requirements:
  - 1. Voltage. The electronic driver shall operate at a nominal input voltage range of between 120 and 277 volts, 60 Hertz.
  - 2. The driver shall provide the proper operating voltage to the LED arrays. Output frequency must be equal to or greater than 120 Hertz to avoid flicker.
  - 3. Power Factor. The power factor of the driver over the design range of input voltages specified above must not be less than 90%.
  - 4. The driver input current must have Total Harmonic Distortion (THD)

of less than 20% when operated at nominal line voltage.

5. The driver must be thermally protected to shut off when operating temperatures reach unacceptable levels.
  6. The driver must meet the requirements of the FCC rules and regulations, Title 47 CFR, part 15 and 18.
  7. The driver shall have a Class A sound rating per ANSI C63.4.
  8. Surge protection. The driver must have internal surge protection of 10kV/5kA per ANSI C62.41.2 - 2002.
  9. The standard drive current shall be 525mA.
- (d) The off-state power consumption of the luminaire shall not exceed 2.5 watts.
- (e) The minimum luminaire efficacy shall be 80 lumens per watt.
- (f) Mounting. The driver shall be mounted and fastened on the driver door in a manner such that the driver will remain secure and capable of withstanding the vibrations and shocks likely to occur when installed and in service. The driver must be readily removable for replacement.
- (g) Wiring. 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 minimum. All wires within a single circuit path must be of the same size. No wire nuts will be allowed. No unnecessary splices will be allowed. The use of wiring smaller than #16 AWG will require the written approval of the Commissioner. Color coding will be in a manner approved by the Commissioner. A complete wiring diagram must be displayed at an approved location on the interior of the luminaire and must include all luminaire and component identification and ratings. The wiring diagram must be provided on high quality material that will be resistant to cracking, yellowing, and fading in a luminaire environment. Quick disconnects must be provided for all components.
- (h) Option:Photo-control Receptacle and Cap. If the contract calls for photo-control, a standard three-prong, twist lock receptacle for a photo-control meeting ANSI standard C136.10 must be mounted in the housing with provision for proper positioning of the photo-control. The receptacle must be able to be repositioned without the use of tools. The photo- control is not required to be furnished, but a shorting cap with a three-prong plug having line-load prongs shorted together and meeting ANSI standard C136.10 must be provided. If the contract calls for no photo-control capability, a shorting cap must be provided.



(i) Component Mounting.

1. Modular Construction. 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.
2. Interchangeability. Components must be mutually field interchangeable so that units can be restored to working condition without trouble shooting components.

**PHOTOMETRIC REQUIREMENTS**

5. (a) The manufacturer must demonstrate that the luminaires will meet or exceed the specified photometric requirements. The manufacturer must provide photometric calculations using published luminaire data as part of the submitted package. The proposal must contain luminaire photometric performance with results equal to or better than those listed in this specification. Submittal information must include computer calculations based on the controlling given conditions which demonstrate achievement of all listed performance requirements. Computer calculations must be performed for roadway lighting and for sidewalk/parkway lighting. The submitted roadway lighting calculations must be done in accordance with I.E.S. RP-8-00, and must include point-by-point illuminance, luminance and veiling luminance as well as listings of all indicated averages and ratios. The submitted sidewalk/parkway calculations must be done in accordance with I.E.S. RP-8-00, and must include point-by-point horizontal illuminance and vertical illuminance as well as listings of all indicated averages and ratios.
- (b) Unless otherwise indicated, the light distribution will be I.E.S. classified as medium-cutoff-Type II/III (M-C-II/III), as defined in the "American National Standard Practice for Roadway Lighting" approved June 27, 2000 by the "American National Standards Institute" (ANSI).
- (c) Performance Requirements (0.7 light loss factor):
  1. Roadway Illuminance:
 

Average Horizontal	1.7 fc
Uniformity Ratio $A_v/\text{Min}$	3:1
  2. Roadway Luminance:
 

Average Luminance	1.2 cd/m <sup>2</sup>
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Uniformity Ratio Av/Min	3:1
Uniformity Ratio Max/Min	5:1
Max Veiling Luminance	0.3

- (d) The photometrics shall be run for the specific requirements. If the luminaires are to be obtained for no specific project, the luminaires must meet the performance requirements for the following physical conditions:

Right-of-way	100'
Curb-to-curb	80'
Mounting height	30'
Setback	3'
Arm length	8'
Sidewalk width	6'
Parkway width	4'
Spacing (opposite)	120'
Pavement	R3

## **TESTING**

6. (a) Testing. All testing must be done on a prototype of the actual luminaire to be provided under this specification. If recent test results are available, they may be considered as meeting the testing requirements of this specification. The Commissioner or Commissioner's representative will have the final approval of which tests are adequate.
- (b) The manufacturer will be responsible for all costs associated with the specified testing, incidental to this contract.
- (c) Photometric testing must be in accordance with IES recommendations. The tests, at a minimum, must yield:
1. An isofootcandle chart with maximum candela and half maximum candela trace.
  2. An isocandela diagram.
  3. Maximum plane and maximum cone plots of candela.
  4. A candlepower table (house and street side).
  5. A coefficient of utilization chart.
  6. A luminous flux distribution table.
- (d) The luminaire must meet the electrical and photometric requirements of IESNA LM -79.

- (e) The luminaire must meet the lumen maintenance requirements of IESNA LM-80.
- (f) The luminaire must meet the requirements of IESNA TM-21 for long term maintenance of LED light sources.
- (g) The LEDs must meet the requirements for chromaticity per ANSI C78.377.
- (h) The following applicable UL standards shall be met:
  - 1. 8750 LED Light Sources in Lighting Products
  - 2. 1598 Luminaires
  - 3. 1012 power units other than Class 2
  - 4. 1310 Class 2 power units
  - 5. 2108 low voltage lighting systems
- (i) Additional Types of Testing.
  - 1. Interchangeability of all component parts.
  - 2. Thermal testing in accordance with U.L. Standard 1572 or Standard 1598. The fixture must be placed in a controlled 25° Celsius environment and be energized for a minimum of 8 hours. At no time will any of the components exceed the manufacturer's recommended operating temperatures. At no time will any surface of the refractor exceed the manufacturer's recommended temperature limits.
  - 3. 2G vibration testing in accordance with ANSI Standard C136.31. Upon completion of the test, all set screws, castings, and components must be secure and undamaged. The luminaire will not be energized for this test. However, the luminaire must be fully operational after the test.
  - 4. Moisture testing in accordance with U.L. Standard 1572 or Standard 1598. The luminaire will be subjected to a water spray from various directions for a sufficient amount of time. After the water spray the inside of the refractor must remain dry and the fixture should be demonstrated to operate properly.

## **PACKAGING**

7. (a) Packing. Each luminaire assembly must be packed in a suitable carton so secure that it must not be damaged in shipment and handling.
- (b) Marking. Each carton containing a luminaire must be clearly marked on the outside in letters not less than three-eighths (3/8) inch tall with the legend: "LUMINAIRE, LED, (400WHPS EQUIVALENT), IES CUTOFF TYPE II/III", the appropriate City Commodity Code Number, the name of the manufacturer, the date of manufacture, and the contract number under which the luminaire is furnished.

THIS SPECIFICATION SHALL NOT BE ALTERED

**ELECTRICAL SPECIFICATION 1586  
DIVISION OF ENGINEERING  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
OCTOBER 28, 2014**

**LUMINAIRE: LED, ORNAMENTAL, ARTERIAL ACORN  
I.E.S. TYPE II/III DISTRIBUTION**

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**SUBJECT**

1. This specification states the requirements for an ornamental Acorn LED street lighting luminaire. The luminaire shall be mounted on a tenon at a mounting height of 16 or 23 feet above grade and have an IES Type II/III medium non-cutoff distribution. The luminaire will be used to provide roadway lighting for arterial streets.

**GENERAL**

2. (a) Information Required. If so requested, the apparent low bidder shall submit the following information relative to the luminaire he proposes to furnish, within fifteen (15) business days of such request:
  1. Outline drawing.
  2. Complete description and weight.
  3. Luminaire efficiency.
  4. Effective projected area in square feet.
  5. Manufacturer's name and catalogue designation.
  6. Manufacturer's part list.
  7. IES formatted photometric curve in electronic format.
  8. Certified test reports.
- (b) Sample. One completely assembled luminaire of the manufacture intended to be furnished shall be submitted upon request of the Chief Procurement Officer within fifteen (15) business days from receipt of notice.
- (c) Assembly. Each luminaire must be delivered completely assembled, wired, and ready for installation. The luminaire must consist of the capital and globe as shown on the Electrical Standard Drawing 912, LED optical system as required to meet the photometric requirements of this specification, electronic driver, quick disconnects, terminal board, fusing, gaskets and all necessary hardware.
- (d) Warranty. The manufacturer shall warrant the performance and construction

of these 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. A reduction of lighting output of more than 30% within the ten years will constitute luminaire failure. Any luminaire or part thereof, not performing as required, or developing defects within this period must be replaced by a new luminaire, delivered to the City by the manufacturer, without expense to the City. The Commissioner will be the sole judge in determining which replacements are to be made and his decision will be final.

- (e) The manufacturer shall have a history of manufacturing roadway and outside area lighting for a minimum of five years. The manufacturer must demonstrate to the City that the manufacturer has the capacity to supply the quantities required for the contract in a timely manner.
- (f) Organizations. The following organizations' specifications are mentioned herein.

ANSI – American National Standards Institute  
ASTM – American Society for Testing and Materials  
IEC – International Electrotechnical Commission  
IES – Illuminating Engineering Society  
UL – Underwriters Laboratories

### **CAPITAL AND FINIAL**

- 3. (a) Material. Each capital and finial shall be cast aluminum conforming to American Die casting Standard ADC-1-C9-83 grade 380.
- (b) Appearance. The capital shall conform in appearance to that shown on Electrical Standard Drawing Number 912.
- (c) Construction. Castings must have smooth external surfaces free from protuberances, dents, cracks or other imperfections marring their appearance. Welding or plugging of casting defects is prohibited.
- (d) Structural Integrity. The capital shall fit over a 3" high by 3" O.D. tenon. 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. 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. 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. The finial shall be securely attached to the acorn

globe such that it will remain in place during the vibrations described above.

#### **CAPITAL AND FINIAL 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) Exterior and Interior Coat. A thermosetting, weathering, Polyester powder coat shall be applied electrostatically to all cleaned and treated surfaces to a uniform four-mil(4.0) thickness in a one coat application. This powder coat must be cured in a convection oven at a minimum temperature of 400° 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. Both the exterior and interior coats shall 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° Fahrenheit and 95% relative humidity without blistering. Before test, the panel must be scribed with an "X" down to the 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 square inches must be not less than 3.0 mils.
- (g) Color. Color shall be gloss black. 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 as well as any other information which will be required to purchase the same color for the masts, mast arms, and split pedestal bases.

#### **COMPONENT MOUNTING**

5. (a) Modular Construction. All electrical components shall be securely mounted by means of easily removable stainless steel captive thumb screws or by easily operated stainless steel latches. No tools shall be necessary to remove components. Provision shall be made to allow easy access to quick disconnects, terminal blocks and components for installation and maintenance.

- (b) Quick Disconnect. Wiring from the terminal block to the components on the mounting plate must utilize a three (3) conductor, phenolic, polarized, quick disconnect device.
- (c) Interchangeability. Component mounting plates must be mutually field interchangeable so that units can be restored to working condition without trouble shooting components.
- (d) Other Methods. Other methods of component mounting may be considered if they are judged to provide the same ease of installation and maintainability. No alternates will be allowed without the specific written approval of the Commissioner.
- (e) Optional Receptacle. If desired, A 120 Volt, grounded receptacle must be provided in an easily accessible location in the capital. It must be separately wired to its own polarized quick disconnect connector. The access door for the component mounting plate must be notched to provide for securing the door with a three wire, #12 AWG, Type S.O. cord plugged into the outlet.

## **ELECTRICAL COMPONENTS**

- 6. (a) LED Optical Array. 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. The LEDs shall deliver a minimum of 70% of initial lumen output at 100,000 hours (L70 at 100K). LEDs shall provide a color rendition index (CRI) of 70. The color temperature of the LEDs shall be 4000 degrees Kelvin. The optical unit shall have an IP66 rating.
- (b) Terminal Block, Fusing, and Wiring. A barrier type terminal board of molded phenolic plastic shall be mounted to the capital in a readily accessible location. The terminal block must have plated copper or plated brass, clamp type pressure terminals of an approved type which will accommodate incoming wire sizes ranging from #12 AWG to #8 AWG. The luminaire must be prewired from the terminal block to and including the electrical components. Two in-line fuse holders will be wired from the terminal to a quick disconnect; the wiring will continue from the quick disconnect to the components mounted on the plate. By disconnecting the quick disconnect, the electrical components on the mounting plate may be removed as a unit, and easily replaced. The in-line fuse holders must accommodate KTK fuses rated for 10Amp, 600VAC, and 100,1000AMP interrupting capacity. The fuses must be included. In lieu of in-line fuses, a fuse block must be provided which will accommodate the same size fuses.
- (c) Driver Requirements:



1. Voltage. The electronic driver shall operate at a nominal input voltage range of between 120 and 277 volts, 60 Hertz.
  2. The driver shall provide the proper operating voltage to the LED arrays. Output frequency must be equal to or greater than 120 Hertz to avoid flicker.
  3. Power Factor. The power factor of the driver over the design range of input voltages specified above must not be less than 90%.
  4. The driver input current must have Total Harmonic Distortion (THD) of less than 20% when operated at nominal line voltage.
  5. The driver must be thermally protected to shut off when operating temperatures reach unacceptable levels.
  6. The driver shall be short circuit protected and over load protected.
  7. The driver must meet the EMI (electromagnetic interference) requirements of the FCC rules and regulations, Title 47 CFR, part 15 and 18.
  8. The driver shall have a Class A sound rating per ANSI C63.4.
  9. The drive current shall be as recommended by the LED manufacturer. The current level should be such that the LEDs are not overdriven or underdriven. LED current should produce the most efficient light output without compromising the life of the LEDs.
- (d) Surge Protection. Surge protection shall be 10kV/10kA per ANSI C62.41.2. The surge protection device shall be a 3 wire device. The suppressor shall be NRTL listed and be in accordance to UL 1449.
- (e) The minimum luminaire efficacy shall be 90 lumens per watt.
- (f) Mounting. The driver shall be mounted in a manner such that the driver will remain secure and capable of withstanding the vibrations and shocks likely to occur when installed and in service. The driver must be readily removable for replacement.
- (g) Wiring. The LED array and driver 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 minimum. The use of wiring smaller than #16 AWG will require the written approval of the Commissioner. Color coding will be in a manner approved

by the Commissioner. All wires within a single circuit path must be of the same size. No wire nuts will be allowed. No unnecessary splices will be allowed. A complete wiring diagram must be displayed at an approved location on the interior of the luminaire and must include all luminaire and component identification and ratings. The wiring diagram must be provided on high quality material that will be resistant to cracking, yellowing, and fading in a luminaire environment. Quick disconnects must be provided for all components.

### **ACORN GLOBE AND REFLECTOR**

7. (a) Appearance. Globe shall conform to that shown on Electrical Standard Drawing 912.
- (b) Material/Construction. 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.

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.

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.

- (c) Globe Mounting. 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. They 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.
- (d) Reflectors. A top reflector and a house-side reflector shall be provided. These reflectors shall be mounted to a removable bracket. 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, to the lamp socket or lamp socket holder. 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.

- (e) Optional Reflector. If so ordered in the line item of a contract, a full top reflector will be provided as part of the globe. This reflector will be inserted between the two halves of the globe and permanently sealed to the globe halves. This reflector will not allow any light from the lamp to enter the top half of the globe.

### **PHOTOMETRIC REQUIREMENTS**

8. (a) The manufacturer must demonstrate that the luminaire shall meet or exceed the specified photometric requirements. The manufacturer must provide photometric calculations using published luminaire data as part of the submitted package. Submittal information must include computer calculations which demonstrate achievement of all listed performance requirements. Computer calculations must be performed for roadway lighting and for sidewalk/parkway lighting. The submitted roadway lighting calculations must be done in accordance with I.E.S. RP-8-14, and must include point-by-point illuminance and luminance, as well as listings of all indicated averages and ratios. The submitted sidewalk/parkway calculations must be done in accordance with I.E.S. RP-8-14, and must include point-by-point horizontal illuminance and vertical illuminance, as well as listings of all indicated averages and ratios.
- (b) Unless otherwise indicated, the light distribution will be classified as medium-non-cutoff-Type II or Type III (M-N-II or M-N-III), as defined in Appendix E of I.E.S. RP-8-14.
- (c) Performance Requirements (0.7 light loss factor):

Roadway Illuminance:

Average Horizontal	1.7 fc
Uniformity Ratio Av/Min	3:1

Roadway Luminance:

Average Luminance	1.2 cd/m <sup>2</sup>
Uniformity Ratio Av/Min	3:1
Uniformity Ratio Max/Min	5:1
Max Veiling Luminance	0.5

- (d) The photometrics shall be run for the specific project requirements. If the luminaires are to be obtained for no specific project, the luminaires must meet the performance requirements for the following physical conditions.

Right of way	80'
Curb-to-curb	48'
Mounting height	23'
Setback	4'
Arm length	0'
Spacing (opposite)	75'
Pavement	R3

## **TESTING**

9. (a) Testing. All testing must be done on a prototype of the actual luminaire to be provided under this specification. If recent test results are available, they may be considered as meeting the testing requirements of this specification. The Commissioner or Commissioner's representative will have the final approval of which tests are adequate.
- (b) The manufacturer will be responsible for all costs associated with the specified testing, incidental to this contract.
- (c) Photometric testing must be in accordance with IES recommendations. The photometric tests must be conducted with a reference lamp and ballast. The tests, at a minimum, must yield:
1. An isofootcandle chart with maximum candela and half maximum candela trace.
  2. An isocandela diagram.
  3. Maximum plane and maximum cone plots of candela.
  4. A candlepower table (house and street side).
  5. A coefficient of utilization chart.
  6. A luminous flux distribution table.
- (d) The luminaire must meet the electrical and photometric requirements of IESNA LM -79.
- (e) The luminaire must meet the lumen maintenance requirements of IESNA LM -80.
- (f) The luminaire must meet the requirements of IESNA TM -21 for long term maintenance of LED light sources.
- (g) The LEDs must meet the requirements for chromaticity per ANSI C78.377.

(h) The following applicable UL standards shall be met:

1. 8750 LED Light Sources in Lighting Products
2. 1598 Luminaires
3. 1012 power units other than Class 2
4. 1310 Class 2 power units
5. 2108 low voltage lighting systems

(i) Additional Types of Testing.

1. Interchangeability of all component parts.
2. Thermal testing in accordance with U.L. Standard 1572 or Standard 1598. The fixture must be placed in a controlled 25° Celsius environment and be energized for a minimum of 8 hours. At no time will any of the components exceed the manufacturer's recommended operating temperatures. At no time will any surface of the refractor exceed the manufacturer's recommended temperature limits.
3. Vibration testing in accordance with ANSI Standard C136.31. Upon completion of the test, all set screws, castings, and components must be secure and undamaged. The luminaire will not be energized during the test, and will not include the LED's and fuses. However, the luminaire must be fully operational after the test.
4. Moisture testing in accordance with U.L. Standard 1572 or Standard 1598. The luminaire will be subjected to a water spray from various directions for a sufficient amount of time to verify that the inside lamp compartment stays dry and that the fixture does not take on water. After the water spray the inside of the refractor must remain dry and the fixture should be demonstrated to operate properly.

## **PACKAGING**

10. (a) Packing. Each luminaire assembly must be securely packed in a suitable carton so that it will not be damaged by shipment and/or handling.
- (b) Marking. Each carton containing a luminaire must be clearly marked on the outside in letters not less than three-eighths (3/8) inch tall with the legend:

"ORNAMENTAL, ARTERIAL, ACORN, LED,I.E.S. TYPE II/III". The appropriate City Commodity Code Number, the name of the manufacturer, the date of manufacture, and the contract number under which the luminaire is furnished shall also be listed.

**ELECTRICAL SPECIFICATION 1587  
DIVISION OF ENGINEERING  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
OCTOBER 29, 2014**

**LUMINAIRE: LED, VIADUCT**

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**SUBJECT**

1. This specification states the requirements for an LED luminaire complete with driver. The luminaire shall be for underpasses such as railroad viaducts and other elevated structures. The input voltage shall be between 120 and 240 volts. The luminaires shall be mounted to the structures, either directly or mounted to a trunnion type bracket.

**GENERAL**

2. (a) Information. If so requested, the apparent low bidder shall submit the following information relative to the luminaire he proposes to furnish within fifteen (15) days of such request:
  1. Outline drawing.
  2. Complete description and weight.
  3. Luminaire efficiency.
  4. Projected area in square feet.
  5. Manufacturer's name and catalogue designation.
  6. Manufacturer's part list.
  7. IES formatted photometric curve in electronic format.
  8. Certified test reports.
- (b) Sample. One completely assembled luminaire of the manufacture intended to be furnished, must be submitted upon request of the Chief Procurement Officer within fifteen (15) business days of such request.
- (c) Assembly. Each luminaire must be delivered completely assembled, wired, and ready for installation. It must consist of an aluminum die-cast housing, LED arrays, terminal block, electronic driver, gaskets, surge arrestor, fuses, trunnion bracket, and all necessary hardware.
- (d) Warranty. The manufacturer shall warrant the performance and construction of these 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. A reduction of lighting output of more than 30% within the ten years will constitute luminaire failure. Any luminaire or part thereof, not performing as required, or developing defects within this period must be replaced by a new luminaire, delivered to the City by the manufacturer, without expense to the City. The Commissioner will be the sole judge in determining which replacements are to be made and his decision will be final.

- (e) The manufacturer shall have a history of manufacturing roadway and outside area lighting for a minimum of five years. The manufacturer must demonstrate to the City that the manufacturer has the capacity to supply the quantities required for the contract in a timely manner.
- (f) Organizations. The following organizations' specifications are mentioned herein.

ANSI – American National Standards Institute  
ASTM – American Society for Testing and Materials  
IEC – International Electrotechnical Commission  
IES – Illuminating Engineering Society  
UL – Underwriters Laboratories

### **CONSTRUCTION**

- 3. (a) Weight and Area. The net weight of this luminaire must not be more than 25 pounds and should be able to be handled by one man.
- (b) Housing. The housing shall be a precision aluminum die-casting composed of aluminum meeting ASTM Specification A380. It must be substantial and adequate enough to withstand the strains likely to be imposed on the housing when installed and in service. The housing must enclose the LED arrays, terminal board, surge protector, and the electronic driver, with provision for proper mounting of these parts. The housing must have integral heat sink characteristics, such that all enclosed components will operate within their designed operating temperatures under expected service conditions. No extra items shall be installed as heat shields or heat sinks. All heat shields and heat sinks shall be integral to the luminaire.

The housing shall be designed to allow water shedding. The housing shall be designed to minimize dirt and bug accumulation on the optic surface.

The housing shall be able to be mounted directly to a wall or to be trunnion mounted. There shall be a .75 inch threaded conduit fitting to accommodate an electrical whip.



- (c) Mounting bracket. A trunnion type bracket shall be provided. The bracket shall be mounted directly to a wall. The luminaire shall then be attached to the bracket. The bracket will allow the luminaire to be positioned up to 90° in either direction from the horizontal. The bracket shall be marked on the outside indicating the degrees of angle. The bracket shall provide for positive locking in the desired position.
- (d) Gaskets. Wherever necessary, in order to make a completely dustproof assembly, gaskets of silicone rubber or other specifically approved material must be provided.
- (e) Hardware. All machine screws, locknuts, pins and set screws necessary to make a firm assembly, and for its secure attachment to the mast arm, must be furnished in place. All hardware must be of stainless steel, copper silicon alloy or other non-corrosive metal, and where necessary must be suitably plated to prevent electrolytic action by contact with aluminum.
- (f) Finish. The luminaire shall have a polyester powder coat with a minimum 2.0 mil thickness. Surface texture and paint quality will be subject to approval. Color must be gloss black or gray (designated ANSI No. 70) as specified in the order. A paint chip must be submitted as a sample upon request. The finish shall pass 1000 hours of salt spray per ASTM B117.
- (g) Ingress Protection. The luminaire housing shall have an ingress protection rating of IP54 or better as described in IEC standard 60529 (also ANSI C136.25-2009). The optical system shall have an IP66 rating.
- (h) The luminaire shall be UL listed. It shall be suitable for wet locations per UL 1598.
- (i) The luminaire shall be rated to operate between -40° to +50° Centigrade.
- (j) A bar code with pertinent information for warranty and maintenance shall be attached to the inside of the housing.

#### **ELECTRICAL COMPONENTS**

- 4. (a) LED Optical Array. 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. The LEDs shall deliver a minimum of 70% of initial lumen output at 100,000 hours (L70 at 100K). LEDs shall provide a color rendition index

(CRI) of 70. The color temperature of the LEDs shall be 4000° Kelvin. The optical unit shall have an IP66 rating.

- (b) Terminal Board-Fuse Block. 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. It must provide all terminals needed to completely prewire all luminaire components. The terminal block must either incorporate a barrier isolated section with fuse clips to take a "small-dimension" cartridge fuse, or a separate barrier protected fuse block must be provided. It must be UL and CSA certified.

The fuses shall be rated at 10 amps 600 VAC with a 100,000 AMPS interrupting capacity. Fuses shall be Buss type KTK, or equal. The fuse block must be wired to the appropriate terminals. The terminal board-fuse block must have plated copper or plated brass, clamp-type pressure terminals of an approved type for "line" connections, to accommodate wire sizes from #12 to #8 A.W.G. The terminals for connection of internal components must be either the screw-clamp or quick disconnect type.

- (c) Driver Requirements:

1. Voltage. The electronic driver shall operate at a nominal input voltage range of between 120 and 277 volts, 60 Hertz.
2. The driver shall provide the proper operating voltage to the LED arrays. Output frequency must be equal to or greater than 120 Hertz to avoid flicker.
3. Power Factor. The power factor of the driver over the design range of input voltages specified above must not be less than 90%.
4. The driver input current must have Total Harmonic Distortion (THD) of less than 20% when operated at nominal line voltage.
5. The driver must be thermally protected to shut off when operating temperatures reach unacceptable levels.
6. The driver shall be short circuit protected and overload protected.
7. The driver must meet the EMI (electromagnetic interference) requirements of the FCC rules and regulations, Title 47 CFR, Part 15.
8. The driver shall have a Class A sound rating per ANSI C63.4.

9. Transient voltage complies with ANSI C62.41 Category A.
  10. The current should be as recommended by the LED manufacturer. The current level should be such that the LEDs are not overdriven or underdriven. LED current should produce the most efficient light output without compromising the life of the LEDs.
- (d) Surge Protection. Surge protection shall be 10kV/10kA per ANSI C62.41.2. The surge protection device shall be a 3 wire device. The suppressor shall be NRTL listed and be in accordance with UL 1449.
  - (e) The minimum luminaire efficacy shall be 90 lumens per watt.
  - (f) Wiring. 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 minimum. All wires within a single circuit path must be of the same size. No wire nuts will be allowed. No unnecessary splices will be allowed. The use of wiring smaller than #16 AWG will require the written approval of the Commissioner. Color coding will be in a manner approved by the Commissioner. A complete wiring diagram must be displayed at an approved location on the interior of the luminaire and must include all luminaire and component identification and ratings. The wiring diagram must be provided on high quality material that will be resistant to cracking, yellowing, and fading in a luminaire environment. Quick disconnects must be provided for all components.
  - (g) Component Mounting.
    1. Modular Construction. 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.
    2. Interchangeability. Components must be mutually field interchangeable so that units can be restored to working condition without trouble shooting components.

## **PHOTOMETRIC REQUIREMENTS**

5. (a) The manufacturer must demonstrate that the luminaires will meet or exceed the specified photometric requirements. The manufacturer must provide photometric calculations using published luminaire data as part of the submitted package. The proposal must contain luminaire photometric performance with results equal to or better than those listed in this

specification. Submittal information must include computer calculations based on the controlling given conditions which demonstrate achievement of all listed performance requirements. Computer calculations must be performed for roadway lighting and for sidewalk lighting. The submitted roadway lighting calculations must be done in accordance with I.E.S. RP-8-14, and must include point-by-point illuminance, luminance and veiling luminance as well as listings of all indicated averages and ratios. The submitted sidewalk calculations must be done in accordance with I.E.S. RP-8-14, and must include point-by-point horizontal illuminance and vertical illuminance as well as listings of all indicated averages and ratios.

- (b) Unless otherwise indicated, the light distribution will be classified as short non-cutoff-Type II (S-NC-II), as defined in Appendix E of I.E.S. RP-8-14.

- (c) Performance Requirements (0.6 light loss factor):

1. Roadway Illuminance:

Average Horizontal	4.5 fc
Uniformity Ratio Av/Min	3:1

2. Roadway Luminance:

Average Luminance	2.5 cd/m <sup>2</sup>
Uniformity Ratio Av/Min	3:1
Uniformity Ratio Max/Min	5:1
Max Veiling Luminance	0.5

- (d) The photometrics shall be run for the specific requirements. If the luminaires are to be obtained for no specific project, the luminaires must meet the performance requirements for the following physical conditions:

Right-of-way	66'
Curb-to-curb	46'
Mounting height	13'
Tilt	45°
Setback	10'
Arm length	1'
Sidewalk width	10'
Spacing (opposite)	30'
Pavement	R3

## **TESTING**

6. (a) Testing. All testing must be done on a prototype of the actual luminaire to be provided under this specification. If recent test results are available, they may be considered as meeting the testing requirements of this specification. The Commissioner or Commissioner's representative will have the final approval of which tests are adequate.
- (b) The manufacturer will be responsible for all costs associated with the specified testing, incidental to this contract.
- (c) Photometric testing must be in accordance with IES recommendations. The tests, at a minimum, must yield:
1. An isofootcandle chart with maximum candela and half maximum candela trace.
  2. An isocandela diagram.
  3. Maximum plane and maximum cone plots of candela.
  4. A candlepower table (house and street side).
  5. A coefficient of utilization chart.
  6. A luminous flux distribution table.
- (d) The luminaire must meet the electrical and photometric requirements of IESNA LM -79.
- (e) The luminaire must meet the lumen maintenance requirements of IESNA LM -80.
- (f) The luminaire must meet the requirements of IESNA TM -21 for long term maintenance of LED light sources.
- (g) The LEDs must meet the requirements for chromaticity per ANSI C78.377.
- (h) The following applicable UL standards shall be met:
1. 8750 LED Light Sources in Lighting Products
  2. 1598 Luminaires
  3. 1012 power units other than Class 2
  4. 1310 Class 2 power units
  5. 2108 low voltage lighting systems
- (i) Additional Types of Testing.

1. Interchangeability of all component parts.
2. Thermal testing in accordance with U.L. Standard 1572 or Standard 1598. The fixture must be placed in a controlled 25° Celsius environment and be energized for a minimum of 8 hours. At no time will any of the components exceed the manufacturer's recommended operating temperatures. At no time will any surface of the refractor exceed the manufacturer's recommended temperature limits.
3. Vibration testing in accordance with ANSI Standard C136.31. Upon completion of the test, all set screws, castings, and components must be secure and undamaged. The luminaire will not be energized for this test. However, the luminaire must be fully operational after the test.
4. Moisture testing in accordance with U.L. Standard 1572 or Standard 1598. The luminaire will be subjected to a water spray from various directions for a sufficient amount of time. After the water spray the inside of the refractor must remain dry and the fixture should be demonstrated to operate properly.

#### **PACKAGING**

7. (a) Packing. Each luminaire assembly must be packed in a suitable carton so secure that it must not be damaged in shipment and handling.
- (b) Marking. Each carton containing a luminaire must be clearly marked on the outside in letters not less than three-eighths (3/8) inch tall with the legend: "LUMINAIRE, LED, VIADUCT". The appropriate City Commodity Code Number, the name of the manufacturer, the date of manufacture, and the contract number under which the luminaire is furnished shall also be listed.

**ELECTRICAL SPECIFICATION 1595  
DIVISION OF ENGINEERING  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
REVISED MAY 14, 2015**

**LUMINAIRE: LED, COBRA-HEAD, ALLEY,  
IES CUTOFF TYPE I/II DISTRIBUTION**

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**SUBJECT**

1. This specification states the requirements for an LED street lighting luminaire complete with driver. The luminaire shall be for alley lighting with an IES Type I/II medium cutoff distribution. The luminaire shall be mounted approximately 18 feet above grade. The overall shape of the luminaire shall be the cobra-head as presently used by the City.

**GENERAL**

2. (a) Information. If so requested, the apparent low bidder shall submit the following information relative to the luminaire he proposes to furnish within fifteen (15) business days of such request:
  1. Outline drawing.
  2. Complete description and weight.
  3. Luminaire efficiency.
  4. Projected area in square feet.
  5. Manufacturer's name and catalogue designation of the luminaire.
  6. Manufacturer's parts list.
  7. IES formatted photometric curve in electronic format.
  8. Certified test results.
- (b) Sample. One completely assembled luminaire of the manufacture intended to be furnished, must be submitted upon request of the Chief Procurement Officer within fifteen (15) business days of such request.
- (c) Assembly. Each luminaire must be delivered completely assembled, wired, and ready for installation. It must consist of aluminum die-cast housing, LED arrays, terminal block, driver-door panel, electronic driver, gaskets, surge arrestor, fuses, slip fitter, photo-control receptacle and all necessary hardware.
- (d) Warranty. The manufacturer shall warrant the performance and construction

of these 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. A reduction of lighting output of more than 30% within the ten years will constitute luminaire failure. Any luminaire or part thereof, not performing as required, or developing defects within this period must be replaced by a new luminaire, delivered to the City by the manufacturer, without expense to the City. The Commissioner shall be the sole judge in determining which luminaires need to be replaced.

- (e) The manufacturer shall have a history of manufacturing roadway and outside area lighting for a minimum of five years. The manufacturer must demonstrate to the City that the manufacturer has the capacity to supply the quantities required for the contract in a timely manner.
- (f) Organizations. The following organizations' specifications are mentioned herein.

ANSI – American National Standards Institute  
ASTM – American Society for Testing and Materials  
IEC – International Electrotechnical Commission  
IES – Illuminating Engineering Society  
UL – Underwriters Laboratories

### **CONSTRUCTION**

- 3. (a) Weight and Area. The weight of this luminaire must not be more than 25 pounds and should be able to be handled by one man. The effective projected area (EPA) must not exceed 0.5 square feet.
- (b) Housing. The housing shall be a precision aluminum die-casting composed of aluminum meeting ASTM Specification A380. It must be substantial and adequate enough to withstand the strains likely to be imposed on the housing when installed and in service. The housing must enclose the slipfitter, LED arrays, photocontrol receptacle, terminal board, surge protector, and the electronic driver, with provision for proper mounting of these parts. The housing must have provision on its top surface to permit leveling with a spirit level. The housing must have integral heat sink characteristics, such that all enclosed components will operate within their designed operating temperatures under expected service conditions. No extra items shall be installed as heat shields or heat sinks. All heat shields and heat sinks shall be integral to the luminaire. The housing will have an appearance similar to existing cobra-head housings typically in use on Chicago's alleys.

The housing shall be designed to allow water shedding. The housing shall be



designed to minimize dirt and bug accumulation on the optic surface.

- (c) Slip Fitter. The slip fitter shall be suitable for attachment over the end of a two (2) inch steel pipe with an approved means of clamping it firmly in place, and must provide a cast-in pipe-stop. The slip fitter must be designed to permit adjustment of not less than five (5) degrees above and below the axis of the mounting bracket. The slip fitter must contain an approved shield around the pipe entrance to block entry of birds.
- (d) Driver Door-Panel. The driver components must be completely assembled and mounted on a die-cast aluminum door-panel composed of aluminum alloy A380. The door-panel must be hinged to the luminaire housing, suitably latched and fastened at the closing end. It must be made to be removed easily. The hinge and fastening devices must be captive parts which will not become disengaged from the door panel.
- (e) Refractor. The refractor must be flat, crystal clear, heat-resistant, boro-silicate glass, well annealed, homogeneous, and free from imperfections and striations. As an option, a clear drop lens refractor of acrylic should be available to replace the flat glass refractor.
- (f) Refractor Holder. The refractor holder must be hinged to the luminaire housing and must open approximately 90 degrees. The refractor must be securely held in the refractor holder. The refractor holder must permit simple removal and replacement of the refractor without the use of tools. The hinge must prevent the refractor holder from disengaging and dropping in case it should swing open.
- (g) Latch. An approved latch must be provided for latching the refractor holder to the housing. The latch must be located opposite a suitable hinge. The latch must be a firm-gripping, easy opening, single action, positive latching type requiring no tools.
- (h) Gaskets. Wherever necessary, in order to make a completely dustproof assembly, gaskets of silicone rubber or other specifically approved material must be provided.
- (i) Hardware. All machine screws, locknuts, pins and set screws necessary to make a firm assembly, and for its secure attachment to the mast arm, must be furnished in place. All hardware must be of stainless steel, copper silicon alloy or other non-corrosive metal, and where necessary must be suitably plated to prevent electrolytic action by contact with aluminum.
- (j) Finish. The luminaire shall have a polyester powder coat with a minimum 2.0 mil thickness. Surface texture and paint quality will be subject to

approval. Color must be gray (designated ANSI No. 70). A paint chip must be submitted as a sample upon request. The finish shall pass 1000 hours of salt spray per ASTM B117.

- (k) Ingress Protection. The luminaire housing shall have an ingress protection rating of IP54 or better as described in IEC standard 60529 (also ANSI C136.25). The optical system shall have an IP66 rating.
- (l) The luminaire shall be UL listed. It shall be suitable for wet locations per UL 1598.
- (m) The luminaire shall be rated to operate between -40° to +50° Centigrade.
- (n) The luminaire shall have the option of adding a house side shield.
- (o) A bar code with pertinent information for warranty and maintenance shall be attached to the inside of the housing. A separate bar code label shall be on the inside of the driver door.
- (p) On the underside of the housing there should be a decal indicating the total wattage and the street application for the luminaire (i.e. "54W,LED, AL" for 54 watt LED luminaire for alleys). The decal should have black characters on a white background. The decal must be legible from ground level.

#### **ELECTRICAL COMPONENTS**

- 4. (a) LED Optical Array. 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. The LEDs shall deliver a minimum of 70% of initial lumen output at 100,000 hours (L70 at 100K). LEDs shall provide a color rendition index (CRI) of 70. The color temperature of the LEDs shall be 4000° Kelvin. The optical unit shall have an IP66 rating.
- (b) Terminal Board-Fuse Block. 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. It must provide all terminals needed to completely prewire all luminaire components. The terminal block must either incorporate a barrier isolated section with fuse clips to take a "small-dimension" cartridge fuse, or a separate barrier protected fuse block must be provided. It must be UL and CSA certified.

The fuses shall be rated at 10 amps 600 VAC with a 100,000 AMPS interrupting capacity. Fuses shall be Buss type KTK, or equal. The fuse block must be wired to the appropriate terminals. The terminal board-fuse

block must have plated copper or plated brass, clamp-type pressure terminals of an approved type for "line" connections, to accommodate wire sizes from #12 to #8 A.W.G. The terminals for connection of internal components must be either the screw-clamp or quick disconnect type.

(c) Driver Requirements:

1. Voltage. The electronic driver shall operate at a nominal input voltage range of between 120 and 277 volts, 60 Hertz.
2. The driver shall provide the proper operating voltage to the LED arrays. Output frequency must be equal to or greater than 120 Hertz to avoid flicker.
3. Power Factor. The power factor of the driver over the design range of input voltages specified above must not be less than 90%.
4. The driver input current must have Total Harmonic Distortion (THD) of less than 20% when operated at nominal line voltage.
5. The driver must be thermally protected to shut off when operating temperatures reach unacceptable levels.
6. The driver shall be short circuit protected and overload protected.
7. The driver must meet the EMI (electromagnetic interference) requirements of the FCC rules and regulations, Title 47 CFR, Part 15.
8. The driver shall have a Class A sound rating per ANSI C63.4.
9. Transient voltage complies with ANSI C62.41 Category A.
10. The current should be as recommended by the LED manufacturer. The current level should be such that the LEDs are not overdriven or underdriven. LED current should produce the most efficient light output without compromising the life of the LEDs.

(d) Surge Protection. Surge protection shall be 10kV/10kA per ANSI C62.41.2. The surge protection device shall be a 3 wire device. The suppressor shall be NRTL listed and be in accordance with UL 1449.

(e) The minimum luminaire efficacy shall be 90 lumens per watt (based on initial lumen output).

- (f) Mounting. The driver shall be mounted and fastened on the driver door in a manner such that the driver will remain secure and capable of withstanding the vibrations and shocks likely to occur when installed and in service. The driver must be readily removable for replacement.
- (g) Wiring. 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 minimum. All wires within a single circuit path must be of the same size. No wire nuts will be allowed. No unnecessary splices will be allowed. The use of wiring smaller than #16 AWG will require the written approval of the Commissioner. Color coding will be in a manner approved by the Commissioner. A complete wiring diagram must be displayed at an approved location on the interior of the luminaire and must include all luminaire and component identification and ratings. The wiring diagram must be provided on high quality material that will be resistant to cracking, yellowing, and fading in a luminaire environment. Quick disconnects must be provided for all components.
- (h) Photo-control Receptacle. A twist-lock receptacle for a photo-control that meets ANSI Standard C136.41 for dimming receptacles must be mounted in the top of the housing with provision for proper positioning of the photo-control. The receptacle shall be 7 position unit having 3 power prongs and 4 contacts. Two contacts shall be for 0-10 volt DC dimming. The other 2 contacts will be for a digital addressable lighting interface. All wire leads from the receptacle must be properly terminated. The receptacle must be able to be repositioned without the use of tools. A photo-control is not required to be furnished, nor is a shorting cap to be provided.
- (i) Component Mounting.
  - 1. Modular Construction. 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.
  - 2. Interchangeability. Components must be mutually field interchangeable so that units can be restored to working condition without trouble shooting components.

## **PHOTOMETRIC REQUIREMENTS**

- 5. (a) The manufacturer must demonstrate that the luminaires will meet or exceed the specified photometric requirements. The manufacturer must provide photometric calculations using published luminaire data as part of the

submitted package. The proposal must contain luminaire photometric performance with results equal to or better than those listed in this specification. Submittal information must include computer calculations based on the controlling given conditions which demonstrate achievement of all listed performance requirements. The submitted roadway lighting calculations must be done in accordance with I.E.S. RP-8-14, and must include point-by-point illuminance, luminance and veiling luminance as well as listings of all indicated averages and ratios.

- (b) Unless otherwise indicated, the light distribution will be classified as medium-cutoff-Type I/II (M-C-I/II), as defined in Appendix E of I.E.S. RP-8-14.

- (c) Performance Requirements (0.7 light loss factor):

1. Roadway Illuminance:	
Average Horizontal	1.0 fc
Uniformity Ratio Av/Min	6:1
2. Roadway Luminance:	
Average Luminance	0.7 cd/m <sup>2</sup>
Uniformity Ratio Av/Min	6:1
Uniformity Ratio Max/Min	10:1
Max Veiling Luminance	0.5

- (d) The photometrics shall be run for the specific requirements. If the luminaires are to be obtained for no specific project, the luminaires must meet the performance requirements for the following physical conditions:

Right-of-way	16'
Mounting height	18'
Setback	0'
Arm length	2'
Spacing (one side)	150'
Pavement	R3

## **TESTING**

6. (a) Testing. All testing must be done on a prototype of the actual luminaire to be provided under this specification. If recent test results are available, they may be considered as meeting the testing requirements of this specification. The Commissioner or Commissioner's representative will have the final approval of which tests are adequate.

- (b) The manufacturer will be responsible for all costs associated with the specified testing, incidental to this contract.
- (c) Photometric testing must be in accordance with IES recommendations. The tests, at a minimum, must yield:
  - 1. An isofootcandle chart with maximum candela and half maximum candela trace.
  - 2. An isocandela diagram.
  - 3. Maximum plane and maximum cone plots of candela.
  - 4. A candlepower table (house and street side).
  - 5. A coefficient of utilization chart.
  - 6. A luminous flux distribution table.
- (d) The luminaire must meet the electrical and photometric requirements of IESNA LM -79.
- (e) The luminaire must meet the lumen maintenance requirements of IESNA LM -80.
- (f) The luminaire must meet the requirements of IESNA TM -21 for long term maintenance of LED light sources.
- (g) The LEDs must meet the requirements for chromaticity per ANSI C78.377.
- (h) The following applicable UL standards shall be met:
  - 1. 8750 LED Light Sources in Lighting Products
  - 2. 1598 Luminaires
  - 3. 1012 power units other than Class 2
  - 4. 1310 Class 2 power units
  - 5. 2108 low voltage lighting systems
- (i) Additional Types of Testing.
  - 1. Interchangeability of all component parts.
  - 2. Thermal testing in accordance with U.L. Standard 1572 or Standard 1598. The fixture must be placed in a controlled 25° Celsius environment and be energized for a minimum of 8 hours. At no time will any of the components exceed the manufacturer's recommended

operating temperatures. At no time will any surface of the refractor exceed the manufacturer's recommended temperature limits.

3. Vibration testing in accordance with ANSI Standard C136.31. Upon completion of the test, all set screws, castings, and components must be secure and undamaged. The luminaire will not be energized for this test. However, the luminaire must be fully operational after the test.
4. Moisture testing in accordance with U.L. Standard 1572 or Standard 1598. The luminaire will be subjected to a water spray from various directions for a sufficient amount of time. After the water spray the inside of the refractor must remain dry and the fixture should be demonstrated to operate properly.

### **PACKAGING**

7. (a) Packing. Each luminaire assembly must be packed in a suitable carton so secure that it must not be damaged in shipment and handling.
- (b) Marking. Each carton containing a luminaire must be clearly marked on the outside in letters not less than three-eighths (3/8) inch tall with the legend: "LUMINAIRE, LED, ALLEY, IES CUTOFF TYPE I/II", the appropriate City Commodity Code Number, the name of the manufacturer, the date of manufacture, and the contract number under which the luminaire is furnished.

**ELECTRICAL SPECIFICATION No. 1600  
CITY OF CHICAGO  
DEPARTMENT OF TRANSPORTATION  
DIVISION OF ENGINEERING  
DECEMBER 9, 2016**

**OUTDOOR LED LUMINAIRE SPECIFICATIONS:  
RESIDENTIAL STREETS, ALLEYS, & ARTERIAL STREETS (Cobra Head)**

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## **I. SUBJECT**

A. This specification states the requirements for non-ornamental Light Emitting Diode (LED) outdoor lighting luminaires. The specified LED luminaires will be used to replace existing High Pressure Sodium (HPS) and Ceramic Metal Halide (CMH) luminaires on Chicago residential streets, arterial streets, and alleys. The LED luminaires will be integrated into a centralized lighting management system.

## **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—Pole 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 Contractor must submit the following information pertaining to each specified luminaire type within fifteen (15) days of request:

1. Completed ATTACHMENT G – Submittal Form
2. 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-I-3.
  - c) LED light source data sheet
  - d) Surge protection device data sheet - if applicable
3. Photometric Performance Data

The manufacturer must provide photometric calculations, as part of each luminaire's submittal package, 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](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 DesignLights Consortium ([www.designlights.org/content/QPL/ProductSubmit/LabTesting](http://www.designlights.org/content/QPL/ProductSubmit/LabTesting)).

ISTMT must be conducted in accordance with the DesignLights Consortium Manufacturer's Guide (<https://www.designlights.org/content/qpl/productssubmit>).

ISTMT shall be conducted in an ambient temperature of  $25 \pm 5$  °C. Ambient temperature variations above or below 25 °C shall be respectively subtracted from or added to temperatures recorded at points on the luminaire.

4. 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).
  5. Vibration Testing - the luminaire must comply with ANSI C136.31 at Vibration Test Level 2 (3.0 G).
  6. Product Samples - at least two samples of each luminaire that the contractor proposes to use must be submitted to the City. All samples must be representative production units and be supplied at no cost to the City.
- C. Assembly.
- Each 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.
- During the warranty period the City may, from time to time, test a random sampling of 10-20 luminaires for verification of light output per IES LM-79 and to test dimming functionality for a given luminaire population. The percentage of luminaires not performing as required in the random sampling will be applied to the total population quantity to determine the number of new luminaire replacements that must be delivered to the City by the manufacturer, without expense to the City.

E. Manufacturing Experience and Capacity

The manufacturer must demonstrate at least a five year history of manufacturing LED roadway and outside area luminaires by providing a list of prior projects with project description, date, location, quantities and reference contact information. The manufacturer must also demonstrate the capacity to supply the quantities required for the contract in a timely manner.

### **III. CONSTRUCTION**

A. Weight

The net weight of these luminaires must not be more than 30 pounds.

B. Housing.

The preferred luminaire housing material is die-cast aluminum alloy meeting ASTM Specification A380. Alternate materials may be considered. The housing must enclose the mounting hardware, LED arrays, control receptacle, terminal board, and electronic driver. The housing must include a surface to facilitate leveling with a spirit level. The housing must have integral heat sink characteristics, such that all enclosed components will operate within their designed operating temperatures under expected service conditions. No external or removable heat shields or heat sinks; are permitted. The housing must be designed to encourage water shedding. The housing must be designed to minimize dirt and bug accumulation on the optic surface.

C. Mounting Provisions.

The luminaire must include a heavy gauge slip fitter clamping assembly suitable for secure attachment over the end of a two (2) inch 2" IP (2.375" OD) steel pipe with an approved means of clamping it firmly in mounting bracket. The slip fitter mounting clamp must contain an approved shield around the pipe entrance to block the entry of birds.

D. Access Door-Panel.

An access door panel allowing access to the terminal strip and LED driver must be provided. A die-cast aluminum door-panel composed of aluminum alloy A380 is preferred; alternate materials may be considered. The door-panel must be hinged to the luminaire housing and suitably latched and fastened at the closing end. It must be made to be removed easily. The hinge and fastening devices must be captive parts which will not become disengaged from the door panel.

E. Hardware.

All machine screws, locknuts, pins and set screws necessary to make a firm assembly, and for its secure attachment to the mast arm, must be furnished in place. All hardware must be of stainless steel, zinc plated steel, copper silicon alloy or other non-corrosive metal, and where necessary must be suitably plated to prevent electrolytic action by contact with dissimilar metals.

F. Finish.

The luminaire must have a polyester powder coat with a minimum 2.0 mil thickness. Surface texture and paint quality will be subject to approval. Color must be as specified in the order. A paint chip must be submitted as a sample upon request. The finish must exceed a rating of six per ASTM D1654 after 1000 hours of testing per ASTM B117. The coating must exhibit no greater than 30% reduction of gloss per ASTM D523 after 500 hours of QUV testing at ASTM G154 Cycle 6.

## G. Ingress Protection.

1. The luminaire electric compartment housing must have an ingress protection rating of IP54 or better as described in ANSI C136.25-2013). The optical system must have a minimum rating of IP 66.
2. The luminaire must be listed for wet locations by a U.S. Occupational Safety Health Administration (OSHA) Nationally Recognized Laboratory (NRTL) and have a safety certification and file number indicating compliance with UL 1598.

## H. General Luminaire Requirements

1. The luminaire must be rated to operate between -40° to +50° Celsius.
2. The luminaire must have the option of adding a house side shield. The shield should be designed to be easily installed in the field. The house side shield must be composed of a sturdy material capable of withstanding vibrations and weather conditions. The shield must cut off light trespass at approximately one mounting height behind the pole.
3. The luminaire must meet the requirements of ANSI C136.22 for internal labeling. A bar code with pertinent information for warranty and maintenance must be attached to the inside of the housing. A separate bar code label must be on the driver
4. The luminaire must be able to provide pertinent product information, for warranty and maintenance purposes, in a digital format that is compliant with the Digital Addressable Lighting Interface (DALI) protocol. This information will be transmitted through the networked Lighting Management control system.

## I. Electrical Components

1. LED Optical Arrays
  - a) The LED arrays must be properly secured at the factory and must not require field adjustment for optimum photometric performance.
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  $\geq 0.9$ .

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 DALI (Digital Addressable Lighting Interface) as per the requirements of IEC 62386. 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. 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 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.

6. 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

1. Light Pollution.

To limit light pollution, the submitted luminaires must not emit any light above the horizon (0 lumens at angles  $\geq 90^\circ$  from luminaire nadir).

2. Lumen Maintenance.

- a) LED arrays must deliver a minimum of 90% of initial lumen output at 36,000 hours of operation.
- b) Light Loss Factor (LLF) < 1.0. Calculations for maintained values, i.e.  $LLF = LLD \times LDD \times LAT$ .
  - (1) Lamp Lumen Depreciation (LLD) calculated at 60,000 hours as per Section II-B-3-d above,
  - (2) Luminaire Dirt Depreciation (LDD)  $\leq 0.90$ , and
  - (3) Luminaire Ambient Temperature (LAT)  $\leq 0.96$

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.

3. Color Attributes

- a) Color Rendering Index (CRI) shall be no less than 65.
- b) Nominal Correlated Color Temperature (CCT) shall be 3000K as defined by ANSI C78.377 and described below:

Manufacturer-Rated	Allowable IES LM-79 Chromaticity Values
--------------------	---

Nominal CCT (K)	Measured CCT (K)	Measured Duv
3000	2870 to 3220	-0.006 to 0.006

4. City of Chicago Typical Lighting Contexts

ATTACHMENT A (below) lists the photometric performance requirements for luminaires used in the following typical municipal outdoor lighting applications:

- Alleys.
- Modern Residential Streets - staggered poles on both sides.
- Legacy Residential Streets - one-sided pole spacing.
- Legacy Residential Intersections and Alley Entrances.
- Arterial Streets – two-sided opposite pole spacing
- Arterial Streets – two-sided staggered pole spacing
- Arterial Streets – one-side pole spacing

See ATTACHMENTS B, C, & C-1 for residential street layouts.

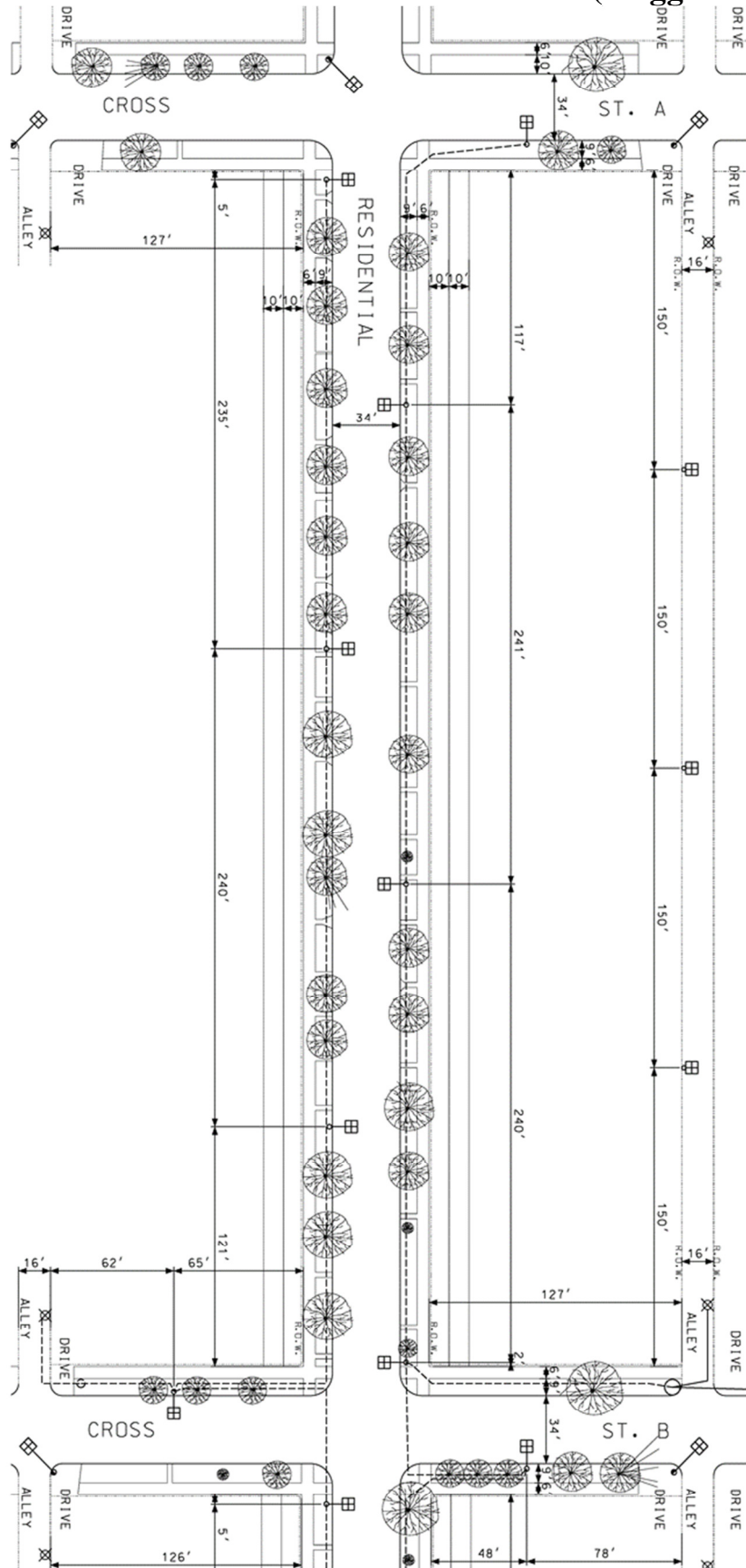
Note: The layout for (i) the intersection of two Legacy Residential Streets, (ii) an alley entrance intersecting with a Legacy Residential Street, and (iii) a typical alley layout is found in ATTACHMENT C-1. Luminaires for both alley entrance lighting and intersection lighting are oriented 45° from the curb line. All other luminaires are oriented 90° from (i.e., perpendicular to) the curb line.

See ATTACHMENTS D, E, & F for arterial layouts.

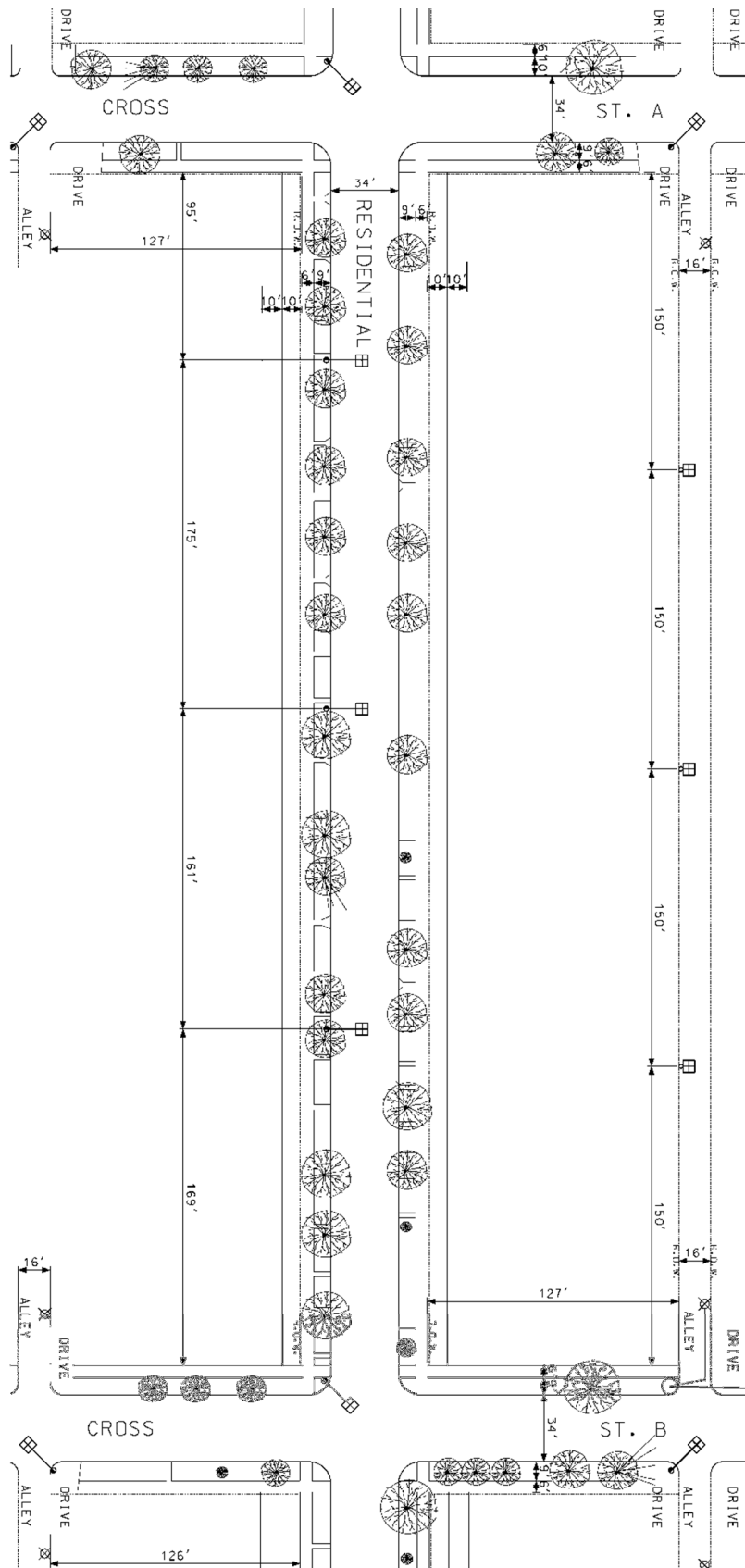
## ATTACHMENT A – Photometric Performance Requirements

STREET PARAMETERS							
TYPICAL LIGHTING CONTEXT	RESIDENTIAL*			ALLEY	ARTERIAL		
POLE CONFIGURATION*	STAGGERED	ONE-SIDED	INT R-R and R-A	ONE-SIDED	OPPOSITE	STAGGERED	ONE-SIDED
RIGHT OF WAY (Width)	66 ft.	66 ft.	66 ft.	16 ft.	100 ft.	80 ft.	66 ft.
IES PAVEMENT CLASS	R3	R3	R3	R3	R3	R3	R3
STREET WIDTH (Curb to Curb)	34 ft.	34 ft.	34 ft.	16 ft.	80 ft.	60 ft.	48 ft.
LANES (Incl Prking &Median)	4	4	4	2	7	6	4
PARKWAY (Width)	10 ft.	10 ft.	10 ft.	N/A	4 ft.	4'	N/A
SIDEWALK (Width)	6 ft.	6 ft.	6 ft.	N/A	6 ft.	6 ft.	9 ft.
HEIGHT TO LUMINAIRE	18 ft.	22 ft.	22 ft.	18 ft.	33 ft.	33 ft.	33 ft.
MAST ARM LENGTH	8 ft.	15 ft.	15 ft.	1 ft.	12 ft.	12 ft.	8 ft.
POLE SETBACK (From Curb to Center of Pole)	3 ft.	2 ft.	2 ft.	N/A	3 ft.	3 ft.	3 ft.
IN-LINE POLE SPACING	See Site Plan Attachments B thru F for pole spacing assumptions for each Pole Configuration context						
MAINTAINED PERFORMANCE REQUIREMENTS							
LUMINAIRE REQUIREMENTS	STAGGERED	ONE-SIDED	INT R-R and R-A	ONE-SIDED	OPPOSITE	STAGGERED	ONE-SIDED
Max Input Power - Default /Normal Luminance (Watts)	120	130	130	80	180	180	180
Default/Normal AVG. Luminance (cd/m²)	≥1.5	≥1.5	≥1.5	≥.95	≥1.7	≥1.7	≥1.7
AVG/MIN Uniformity Ratio	≤ 6:1	≤ 6:1	≤ 6:1	≤ 6:1	≤ 3:1	≤ 3:1	≤ 3:1
MAX/MIN Uniformity Ratio	≤10:1	≤10:1	≤10:1	≤ 10:1	≤ 5:1	≤ 5:1	≤ 5:1
MAX Veiling Luminance Ratio	≤ 0.4	≤ 0.4	≤ 0.4	≤ 0.4	≤ 0.3	≤ 0.3	≤ 0.3
AVG. Boosted Luminance (cd/m²) [Add-Alternate]	≥2.25	≥2.25	≥2.25	≥1.5	≥2.5	≥2.5	≥2.5
SIDEWALK							
Default AVG. Horizontal Illuminance (fc)	≥0.50	≥0.50	≥0.50	N/A	≥0.50	≥0.50	≥0.50
AVG.MIN Uniformity Ratio (Horizontal Illuminance)	≤ 4:1	≤ 4:1	≤ 4:1	N/A	≤ 4:1	≤ 4:1	≤ 4:1
LIGHT TRESPASS RESTRICTIONS - (as measured in a vertical plane 10' beyond ROW ≤3' height)							
MAX Vertical Illuminance	≤ 0.07	≤ 0.30	≤0.30	≤ 0.05	≤ 0.3	≤ 0.30	≤ 0.30
*Residential Pole Configuration Contexts: See Attachments B, C, & C-1 Staggered = Residential street with Modern poles; (aluminum davit poles staggered on both sides of street) Attachment B. One-Sided = Residential street with Legacy poles; (steel poles on one side of street) Attachment C INT R-R = intersection of two Legacy residential streets, illuminated by one luminaire oriented diagonally (45°), Attachment C-1. INT R-A = intersection of Legacy residential street with alley, illuminated by one luminaire oriented diagonally (45°), Attachment C-1.							

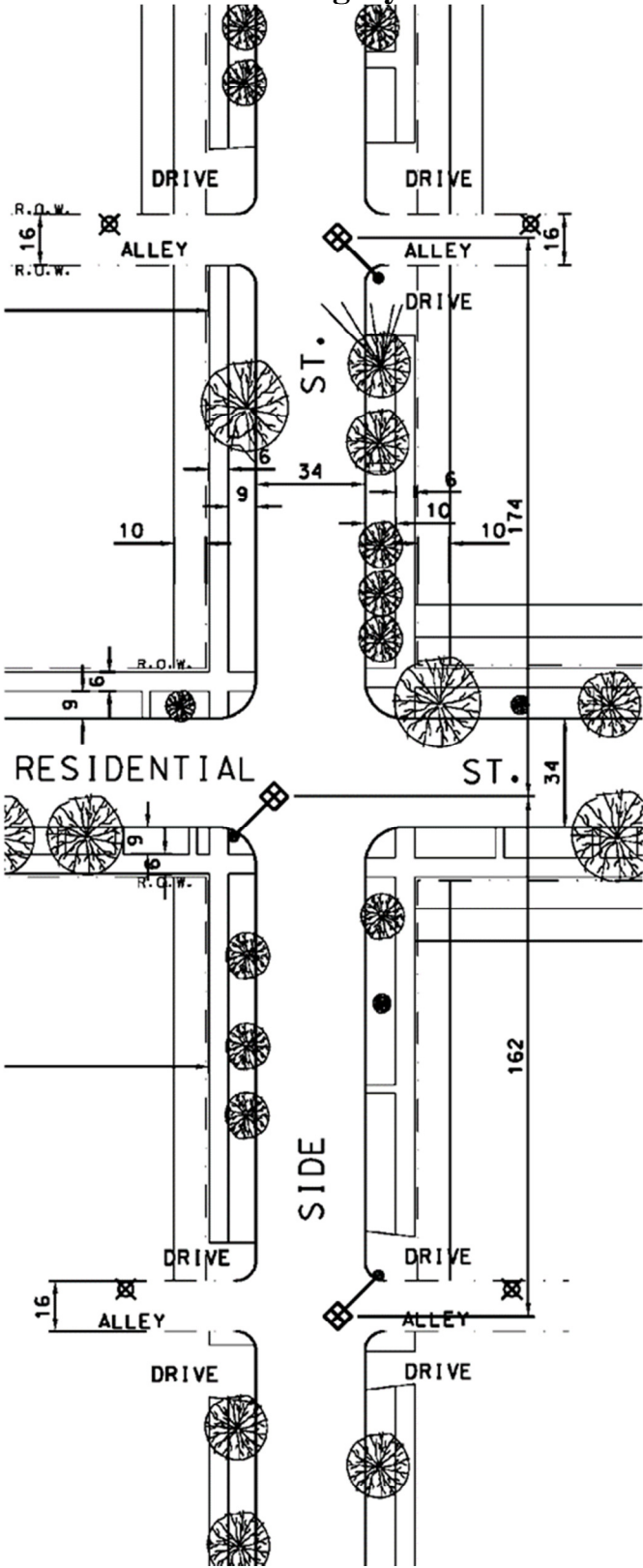
# ATTACHMENT B – Residential Modern Street (Staggered) & Alley



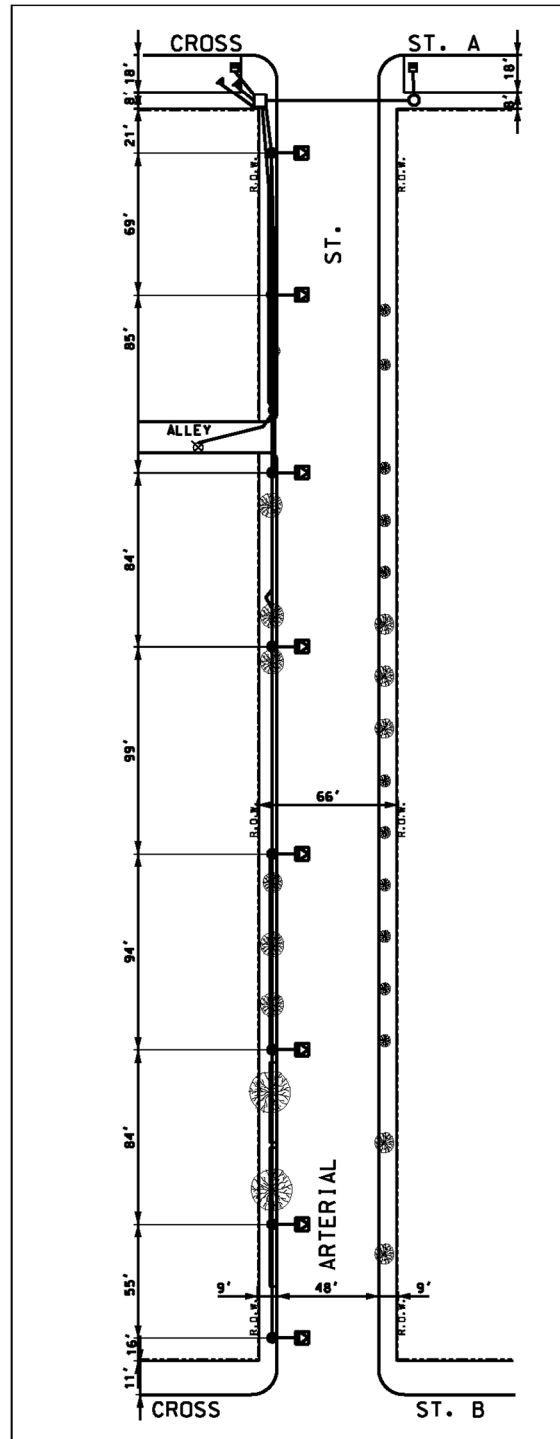
# ATTACHMENT C – Residential Legacy Street (One-sided) & Alley



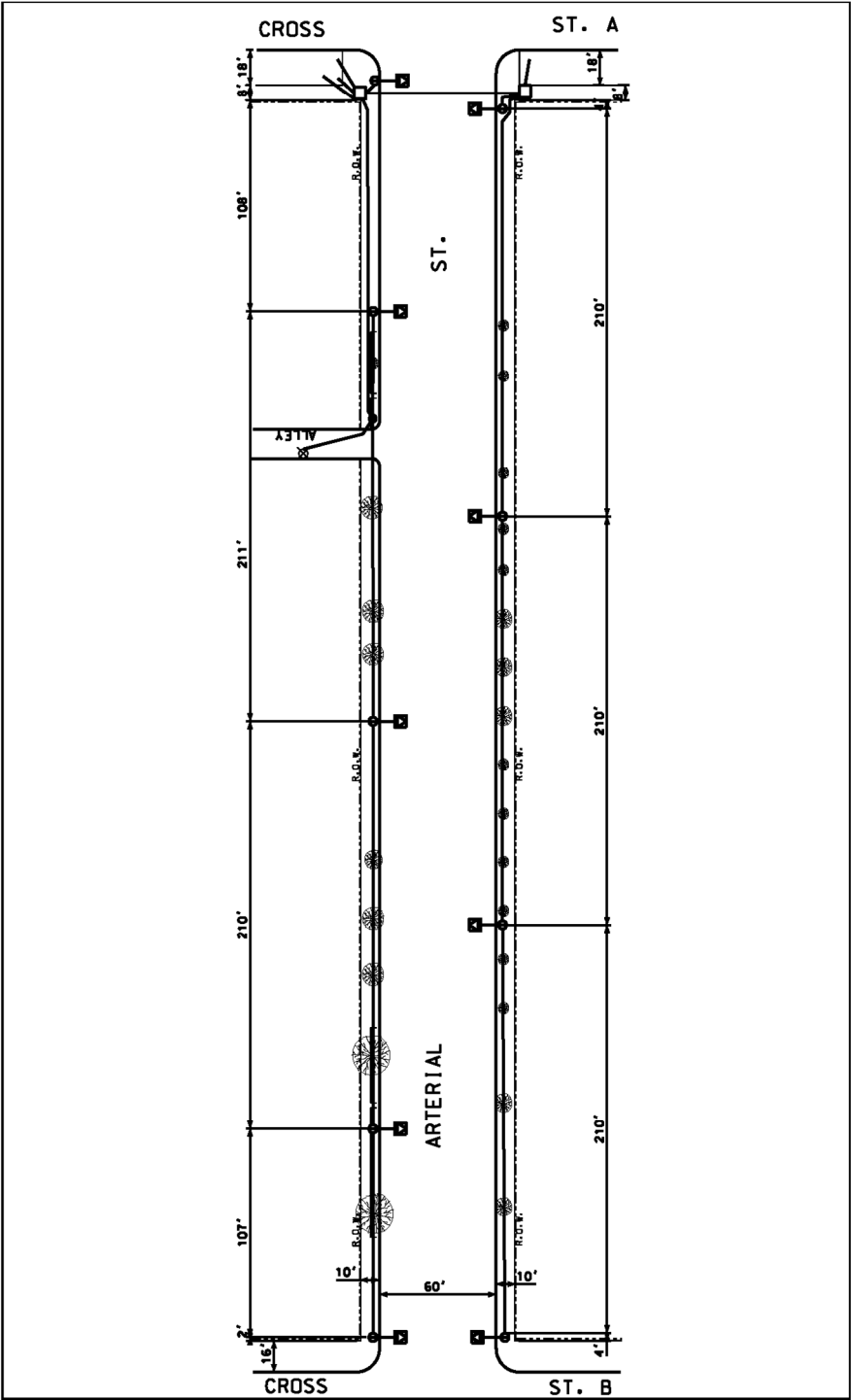
ATTACHMENT C-1-Intersections-Legacy Residential Streets & Alley



## ATTACHMENT D – Arterial Street Single-Sided Poles

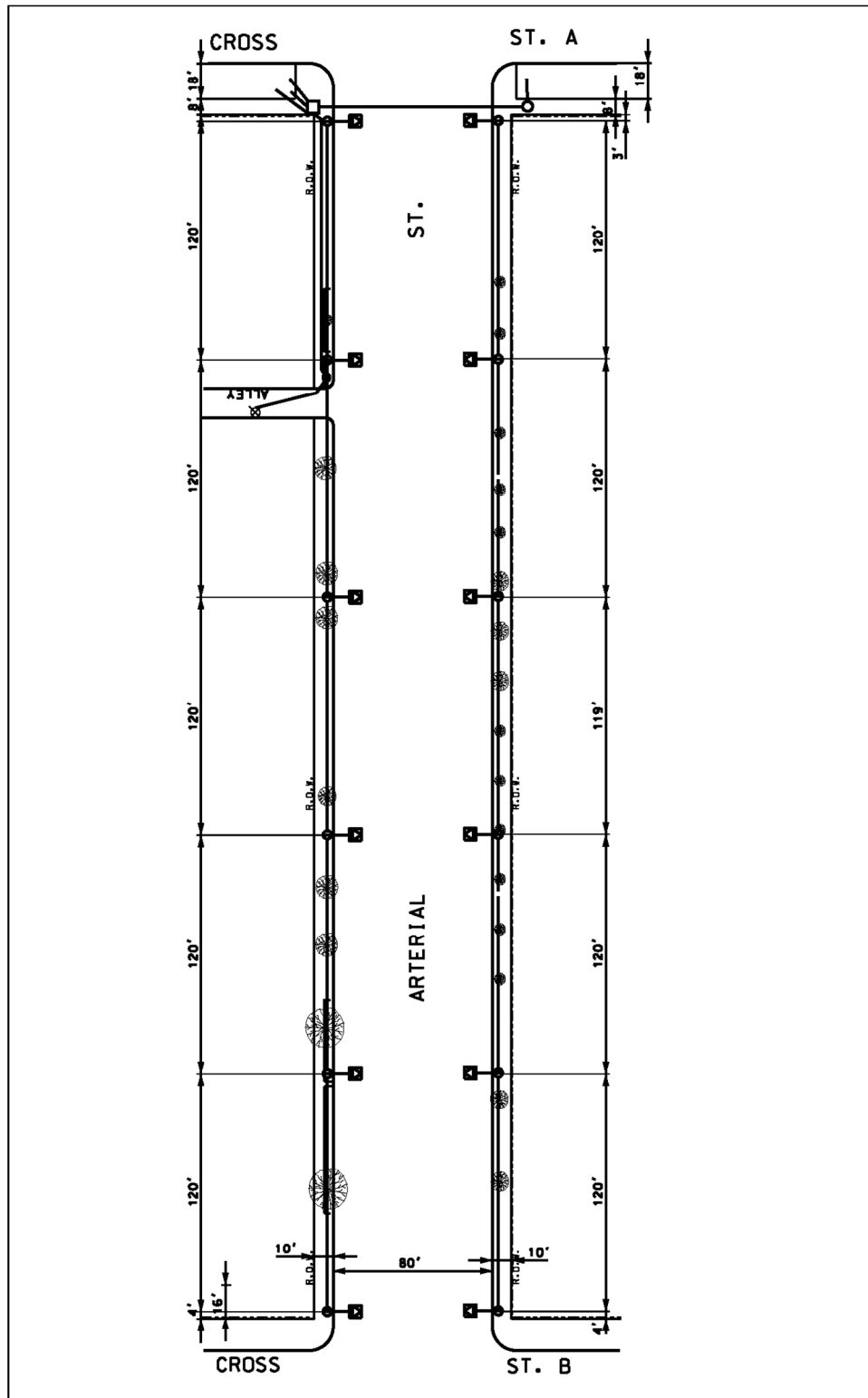


ATTACHMENT E – Arterial Street - Staggered Poles





## ATTACHMENT F – Arterial Street Opposite Poles



## ATTACHMENT G - Product Submittal Form

Lighting Context	e.g. Alleys		
<b><i>Product Information Description</i></b>	<b><i>Product Data (Summary)</i></b>		<b><i>Submittal Reference Document</i></b>
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	<input type="checkbox"/> ANSI C136.41, 7-pin		
LED Driver – dimming capability	<input type="checkbox"/> Dimmable, 0-10V	<input type="checkbox"/> Dimmable, DALI	
LED driver- rated life	years		
Electrical transient immunity ANSI C136.2 combination wave test level	<input type="checkbox"/> Basic (6kV/3kA)	<input type="checkbox"/> Enhanced (10kV / 5kA)	<input type="checkbox"/> Elevated (20kV/10kA)
Vibration Test-ANSI C136.31	<input type="checkbox"/> 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

APPENDIX B  
CDOT SPECIAL PROVISIONS

**APPENDIX B**

**CITY OF CHICAGO**  
**DEPARTMENT OF TRANSPORTATION**  
**STANDARD SPECIFICATIONS**

SPECIFICATION NAME

---

Substitution of Warm Mix Asphalt for Hot Mix Asphalt  
Paving Special Provision for WMA/HMA/SMA Materials  
Jointing P.C. Concrete Pavement and P.C. Concrete Base  
Operation of Traffic Signals  
Traffic Signal Turn-On

## **Substitution of Warm Mix Asphalt for Hot Mix Asphalt (CDOT)**

Effective: April 1, 2015

Revised: March 1, 2016

**Description.** Work under this item shall consist of designing, producing and placing Warm Mix Asphalt (WMA) in lieu of Hot Mix Asphalt (HMA). Work shall be performed according to sections 406, 1030, and 1102 of the Standard Specifications for Road and Bridge Construction and the IDOT Warm Mix Asphalt (BDE) except as herein modified.

**General Requirements.** The use of WMA technology shall be required for placements occurring between November 1 and May 1.

**Equipment.** The use of a foaming technology shall not be allowed. Warm Mix Asphalt additives shall be incorporated at the plant and according to Article 1102.01(a)(10) of the Standard Specifications.

**Mix Design.** Contractor shall perform a verification of their existing approved mix design with the warm mix additive incorporated at the manufacturers recommended dosage. The verification testing, at optimum AC, shall be comprised of one  $G_{mb}$  and one  $G_{mm}$  sample. The voids shall be within 0.5% of the design value. A Hamburg test (AASHTO T 324) will be required and shall be in accordance with the "HMA Mix Design Requirements (D-1)" Special Provision. One wheel shall be required; an average is acceptable. The volumetric and Hamburg results shall be submitted to the Commissioner for approval. The Commissioner reserves the right to perform their own verification testing using blended aggregate supplied by the contractor.

### **Construction Requirements.**

Add the following paragraph to Article 1030.06(a) of the Standard Specifications:

"If a test strip has already been performed and approved on the design, used as HMA, then a new test strip shall not be required on the design used as WMA. If a nuclear correlation was performed and approved on the design, used as HMA, a new correlation shall not be required on the design used as WMA unless the Commissioner determines a new correlation is necessary."

### **Basis of Payment.**

All costs associated with this special provision shall be considered incidental to the contract unit price of the HMA mixes involved.

## **PAVING SPECIAL PROVISION FOR WMA/HMA/SMA MATERIALS**

Effective: April 1, 2016

**Description.** Work under this item shall consist of all construction activities associated with the milling and paving of Warm Mix Asphalt (WMA)/Hot Mix Asphalt (HMA)/Stone Matrix Asphalt (SMA) materials. Work shall be performed according to the IDOT Standard Specifications for Road and Bridge Construction (SSRBC), except as herein modified. This Special Provision addresses the proper techniques for longitudinal joint construction, compaction, segregation control, mixture transportation, smoothness, and tack coat preparation and application.

**General Requirements.** Must meet equipment requirements for Illinois Department of Transportation Prequalification in Work Category 3 – Hot Mix Asphalt (HMA) Plant Mix, requiring an approved HMA plant, an approved HMA spreading and finishing machine and compaction equipment.

### **Construction Requirements.**

Article 406.05(a) Preparation. Insert the following paragraph after the third paragraph.

“All loose material shall be removed from the surface to be paved. Any material not well adhered to the underlying strata shall be removed prior to application of tack coat.”

Article 406.05(b)(1) Tack Coat for Brick, Concrete or HMA Bases. Replace the first sentence with the following:

“The pavement shall be cleaned to the engineer’s satisfaction and free of dirt, dust, debris, organic matter, and other deleterious materials prior to application of tack coat. The contractor shall notify the Engineer that the pavement is ready for inspection prior to tack coat application. The contractor shall provide sufficient notice to the Engineer to allow for inspection and testing at the Engineer’s discretion.”

Article 406.05(b) Tack or Prime Coat. Delete the first sentence of the second paragraph and replace it with the following:

“Residual asphalt rate shall be tested sufficiently to ensure proper application. For CDOT projects, the minimum frequency of testing shall be one test per lift for every 5,000 Tons placed, or every 5<sup>th</sup> paving day, whichever occurs first. If failing results are encountered, each application shall be tested until passing results are found. Payment deduction will be enforced for all pavement affected by failing results. A failing test applies to all areas from the beginning of the job or the most recent passing result. Payment for areas with less than required tack coat shall be:

$$\% \text{ Payment} = (\text{Tack Coat Applied})/(\text{Tack Coat Required}) \times 100\%$$

The reduction will be applied to the payment for the HMA lift immediately above the insufficient tack coat.”

Article 406.06(e) Spreading and Finishing. Insert the following paragraphs after the second sentence in the last paragraph:

“The stringline shall be painted on the pavement or base in a manner that provides a clear, well defined path for the paver operator to follow. The paver operator shall operate the paver in such a manner that the stringline guide is clearly visible. The stringline shall be used for every lift. Additional care must be taken where curved streets are being paved to ensure a good guideline through the curves.

All paving shall be performed with an operating vibratory screed. The vibrator must be functional for the entire width of the screed and shall be active during all paving.

The use of the grade reference device is required for all mainline pavement. Any pavement obstructions which restrict its use must be reported to the Engineer immediately.

The paver screed shall be operated such that the end gate shoe is in contact with or within ½” of the pavement surface while paving to properly form the pavement edge and minimize the need for raking at the joints.”

Article 406.06(f) Segregation Control. Insert the following paragraph after the third paragraph:

“The Engineer will inspect the pavement for evidence of segregated mix producing “fat” spots. “Fat” spots are defined as localized areas of high AC content and may appear to the eye as small areas of flushing. For any HMA lift, a 1 ton deduction in quantity will be applied for each fat spot exceeding 1’ x 1’. Removal and replacement may be required by the Engineer in the case of excessively large areas.

CDOT HMA Workmanship Inspection forms will document fat spots and other forms of segregation and will be required for payment and project close-out.”

Article 406.06(g)(1) Transverse Joints. Insert the following sentence after the last paragraph:

“A transverse construction joint shall be established any time the paving operation is halted for 20 minutes or more.”

Article 406.06(g)(2) Construction Joints. Insert the following paragraph after the last paragraph:

“The contractor shall continuously monitor the constructed longitudinal joints for straightness. Using the 16’ rolling straight edge (required to be provided by the contractor per Article 406.11), the Engineer will assess a 1 ton quantity deduction for each instance where a 2” or greater deviation in the longitudinal joint is found within the length of the straightedge. No more than 1 deduction will be assessed in any 16’ length. Joint straightness deductions will be reported as part of the CDOT Daily HMA Workmanship Inspection form and are required for payments and for project close-out.”

Article 406.07(a) Rollers. Revise Table 1 note /3 to read:

“A vibratory roller ( $V_D$ ) may be used in lieu of the pneumatic-tired roller.”

Article 406.07(c) Density. Insert the following paragraph after the first paragraph:

“All cores for acceptance of HMA shall be cut within 24 hours of paving and all test results shall be transmitted to the Engineer with 24 hours of coring. No further paving shall be permitted until all results are submitted to the Engineer.”

Article 406.11 Surface Tests. Revise the second sentence of the first paragraph to read:

“Surface variations of the mainline pavement shall not exceed 3/8 in. (5 mm).”

Article 406.11 Surface Tests. Insert the following paragraph after the last paragraph:

“The Engineer will test smoothness daily, preferably during paving to allow for the possibility of rolling out some defects and minimize the need for additional traffic control. Each paved lane will be tested, at a minimum in the wheel path closest to the centerline of the roadway. The Engineer may, at their discretion, allow exclusion of penalty in areas extending 10’ from the radius of a street return and 5’ from an embedded drainage or utility structure, as well as test sections. All smoothness inspection shall be reported on the CDOT Daily HMA Workmanship Inspection form and are required for payments and for project close-out.”

Article 1030.05(d)(3) Required Field Tests. Add the following sentence to the end of the second paragraph:

“The lowest acceptable R-squared for a correlation in the Standard Test Method for Correlating Nuclear Gauge Densities shall be 0.87.”

Article 1030.08 Transportation. Insert the following paragraph after the first paragraph:

“Diesel shall be prohibited from use as a cleaner or release agent on the box, gate, pan and other areas of HMA contact. The detection of diesel in these areas is grounds for rejection of the load, even if it has already been dumped into the hopper of the paver. Trucks rejected from the job site will not be allowed back on CDOT projects until inspected and accepted by the Engineer.”



Article 1030.08 Transportation. Insert the following paragraph after the last paragraph:

“Trucks with tarps that do not fully cover the truck bed shall be prohibited from the project. All trucks shall be equipped with a suitable spread pan to allow the HMA to be dumped into the paver hopper with minimal spillage.”

Article 1101.01(g) Rollers. Add to the last paragraph the following:

“The Engineer will confirm the recommended frequency and amplitude have been verified daily by QC with a reed tachometer and properly documented on the appropriate QC forms and density reports.”

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 sewer 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 an 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 spacing 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 spacing 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 forth 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 spacing 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 C  
CHICAGO DEPARTMENT OF WATER MANAGEMENT  
SELECTED 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:

Issued By: \_\_\_\_\_ Date:



## **APPENDIX C**

### **CITY OF CHICAGO** **DEPARTMENT OF WATER MANAGEMENT SPECIFICATIONS** **APPENDIX TO SPECIAL PROVISIONS**

<b>SECTION NUMBER</b>	<b>SPECIFICATION NAME</b>
01 11 00	Summary of Work
01 25 00	Security Requirements
01 30 00	Health and Safety
01 32 36	Televised Inspection of Sewer Mains
01 42 00	References Definitions & Abbreviations
05 10 00	Structural and Miscellaneous Steel
31 23 10	Excavation, Trenching and Backfilling
31 23 19	Dewatering Excavations
33 01 30	Cleaning and Lining Sewer Mains
33 05 22	Repair and Adjustment of Sewer Mains and Structures
33 31 13	Sewer Main Pipe and Fittings
33 39 13	Sewer Manholes, Catch Basins, Inlets, and Special Structures

**SECTION 01 11 00**  
**SUMMARY OF WORK**

**PART 1 - GENERAL**

1.1 SECTION INCLUDES

- A. Description of Work
- B. Constraints
- C. Work Sequence
- D. Emergencies
- E. Project Signs
- F. Dust Control
- G. Salvaging of Existing Materials
- H. Restoration
- I. Contractor Work Documentation Submittals

1.2 DESCRIPTION OF WORK

- A. General Description of Work: Work to be done under this Contract is described in the *Project Information* found on Book 2 of these specifications.
- B. Furnishing all Labor, Materials, Equipment, and Transportation Services: Contractor must furnish all labor, materials, proper equipment and machinery, and transportation services necessary to perform and complete, in a workmanlike manner and within the specified time, all Work required under this contract.
- C. Project site: Contractor must maintain the project site and Work area in a clean, orderly and safe manner.
- D. Coordination: Contractor must coordinate his Work with other contractors, agencies, and utilities as required or directed by the Commissioner.
- E. Protection of work: Contractor must provide protection, repair and restoration of all finished Work or property damaged during construction.

- F. Implied Work: It is the intent of these Specifications to provide the City with improvements to, and ability to maintain a complete operable water distribution system. Any part or item of Work, which is implied and normally required to make each water main installation satisfactorily and completely operable, is deemed to be included in the Work and Contract price. All miscellaneous appurtenances and other items of Work incidental to meeting the intent of the Contract Documents is also deemed to be included in the Work and Contract price, even though such appurtenances may not be specifically shown or specified.
- G. Water Use Permitting: The contractor will be required to apply for a water use permit from the Department of Water Management per Book 1, Section X, subsection A of the Contract Documents. All fees associated with water use necessary for Department of Water Management generated projects will be waived.

There will be no separate fee reimbursement in connection with all the above permits and fee requirements and all costs therefore will be considered as incidental to the Project.

Department of Water Management  
(Water Use) Room 803a, City Hall  
60602

### 1.3 CONSTRAINTS

- A. The Contract documents are intended to allow the Contractor flexibility in the construction of the Work; however, the Contract Documents do contain constraints on project activities. In addition to constraints that may be stated elsewhere in the Contract Documents, the following also apply:
1. Prepare and submit a comprehensive schedule of the proposed sequence of construction of the various parts of the Work included under this contract for review by the Commissioner. Arrange the schedule to complete the Work in phases and permit operation by the City of completed phases or parts thereof as directed by the Commissioner.

2. Work under this Contract must also be accomplished while maintaining access to the surrounding residences, businesses and facilities. Any Work that affects access must be carried out such that the fire protection and emergency services will not be jeopardized or materially reduced as a result of the Work performed during the construction period.
3. Work under the Contract must be accomplished while maintaining water service and fire protection to surrounding residences, businesses and facilities. Any Work that affects the existing water service or fire protection must be carried out so that existing service will not be jeopardized or materially reduced as a result of the Work performed during the construction period.
4. The Contractor must maintain emergency access to surrounding residences, businesses and facilities at all times.
5. The Commissioner will be the sole judge of when the Contractor's operations are causing interference with water distribution operations, and the Commissioner's orders and instructions must be carried out without delay.
6. Conduct operations so as not to inconvenience the general public.
7. The critical path method (CPM) schedule of the general proposed Work specified in Book 1 is to be submitted electronically in Primavera.

B. Notification and Limitations of Water Service shut downs.

1. When an existing water main or section of the main is to be shut down during the course of construction, individual consumers must be notified at least seventy-two (72) hours prior to the shutdown at twenty-four (24) hours prior to shut down and at transfer completion (See Exhibit "Water Service Interruption"). The Contractor must not operate an existing water valve for a shut down or other purpose, without notifying and obtaining Commissioner approval.

2. Time for consumer shut downs must not exceed an eight (8) hour period. No shut downs will be permitted before 8:00 AM without prior written approval of the Commissioner.
3. If emergency shut downs are required, the Contractor must notify customers within the affected area immediately. Notification must be verbal, or written if the customer cannot be contacted and placed at the property site showing all pertinent information regarding the shutdown. The notice must contain a phone number the consumer may call for information or express any concerns they have about the shutdown.
4. If it is determined a consumer cannot withstand a planned shutdown of water service due to providing a critical emergency service, the need to maintain an ongoing manufacturing process, or medical reason, the Commissioner must be notified 48-hours before the shutdown is started by the Contractor.

#### 1.4 WORK SEQUENCE

Construct the Work in stages as indicated on the drawings, unless directed otherwise by the Commissioner. Work must proceed in such manner so as to accommodate the City's and public's use of the project site during construction the period.

#### 1.5 EMERGENCIES

In an emergency affecting the safety of life, work or adjoining property, the Contractor, without special instruction or authorization from the Commissioner, may act as necessary to prevent loss or injury. In such an emergency, if the Contractor is instructed or authorized by the Commissioner to act to prevent loss or injury, he must so act without appeal. The amount to be paid to the Contractor for such emergency work will be determined in the same manner as the amounts to be paid for alterations as determined under "Payment for Changes" in BOOK 1, TERMS AND CONDITIONS FOR CONSTRUCTION.

#### 1.6 PROJECT SIGNS

The Contractor must furnish, erect and maintain at each Work Area at points and in positions to be designated by the Commissioner, two signs 2'-0" X 3'-0" or other signs as directed. Lettering on each sign will be as per the Details or as ordered or provided by the Commissioner. Upon completion of the work, the Contractor must remove all such signs unless otherwise ordered by the Commissioner and deliver these signs to the Department. The cost of furnishing, erecting and maintaining project signs will be included in the prices bid for Mobilization.

#### 1.7 DUST CONTROL

The Contractor's operations, including hauling of materials and backfill, and mixing of concrete, must be constructed in such a way as to keep dust to a minimum. In the event that the Contractor's operations create a nuisance due to the presence of excessive dirt and dust, at the work site or along the route of his hauling operations, he must upon orders from the Commissioner, immediately dispel the dust nuisance by removing the cause or by applying a suitable dust-reducing agent. No additional payment will be made to the Contractor resulting from any expenses incurred by him while eliminating dust as specified.

#### 1.8 SALVAGING OF MATERIALS

The Contractor must use reasonable care in removing materials designated for salvage encountered in the work, and will deliver this material to locations designated by the Commissioner.

The Contractor must obtain a signed and dated receipt for all materials that are delivered to the designated storage point.

#### 1.9 RESTORATION

In constructing the Items of surface restoration under this Contract, the Contractor must clean and adjust all existing catch basins along the route of the work when ordered by the Commissioner. The Contractor must also repair or replace all damaged catch basins and inlets, including drain connections if necessary, and must replace all gutter boxes with inlets, wherever, in the opinion of the Commissioner, such should be done.

Catch basins or inlets which are not located along the route of the work of this Contract but which are destroyed or damaged by the Contractor due to his construction or hauling operations must be repaired or replaced by the Contractor at his expense. Gutter boxes which are not located along the route of the work of this Contract, but which are destroyed or damaged by the Contractor due to his construction or hauling operations must be replaced by the Contractor at his expense.

All restoration of pavements must comply with the requirements of the latest CDOT "Regulations for Openings, Construction and Repair in the Public Way".

After completion and acceptance of all water main work, Contractor must complete full pavement restoration within thirty (30) calendar days. Contractor will be responsible for maintaining the roadway(s) in a safe and passable condition during construction through the installation of final surface and pavement markings.

#### 1.10 CONTRACTOR WORK DOCUMENTATION SUBMITTALS

- A. Contractor must document all construction related activities including but not limited to the amount of material used, labor and fixed rate items as requested by the Commissioner. This documentation must conform with the guidelines set by the City of Chicago.
- B. All construction equipment costing be in conformance with IDOT Force Account Billing procedures based on the Equipment Watch Rental Rate Blue Book.
- C. Contractors must enter all pre-construction and post-construction inspections, digital photographs, daily work sheets, daily work activities, completion statuses and billing information into the Department's work order tracking system: DataStream 7i (Info EAM 8.2), CW and Primavera (P-6). Payment will be made for only the completed and accepted Work which is properly entered into DataStream by the Contractor. Contractor is required to enter the data via wireless communication devices compatible with the above mentioned work order tracking system software.

- D. Contractor will be responsible for all expenses in order to document their work force productivity including but not limited to the procurement of above mentioned software, licenses and wireless communication devices. The initial training regarding the above software and technology systems will be provided by the Department with a “Train the Trainer” approach as part of the initial agreement. All subsequent training sessions for Contractor’s staff required to use these systems must be conducted by the Contractor.
- E. Contractor is responsible for ensuring that all work is completed in accordance with the Time of Completion in the Proposal Section of Book 2. The only work assignment source will be DataStream; no other sources will be acceptable for evaluating the timeline outlined in this document. Any emergency or rush work orders will be entered and transferred into DataStream or the City’s 311 Service Request System by the Department.
- F. After completion and acceptance of all water main work (the final water main connection), Contractor must complete concrete cap/plug within seven (7) calendar days. Substantial completion of all pavement and parkway restoration, including but not limited to ADA ramps, sidewalk, curb and gutter, striping, landscape, etc. must be completed within thirty (30) days of the installation of the concrete cap/plug. Contractor will be responsible for maintaining the roadway(s) in a safe and passable condition during construction through the installation of final surface and pavement markings. If the work is completed when the asphalt plants are closed, the Contractor shall have forty-five (45) days after the plants begin operation to complete the work.



# **NOTICE of Water Service Interruption**

Project:

Street Location:

**DEAR OWNER OR OCCUPANT**

The water supply to your house, building and / or property will be temporarily interrupted due to water system improvement work in your neighborhood.

DATE: \_\_\_\_\_

BETWEEN the HOURS of \_\_\_\_\_ and \_\_\_\_\_ .

Please contact \_\_\_\_\_ with  
\_\_\_\_\_ at phone no.:  
with any questions or concerns.

Thank you in advance for your patience.

Department of Water Management, City of  
Chicago

END OF SECTION 01 11 00

**SECTION 01 25 00**  
**SECURITY REQUIREMENTS**

**PART 1 – GENERAL**

**1.1 SUMMARY**

- A. Contractor must comply with Department of Water Management Security Requirements.
- B. Provide completed Background Check Consent Forms and Visitor Authorization Request Forms to receive authorization to access Site.

**1.2 DEPARTMENT OF WATER MANAGEMENT SECURITY REQUIREMENTS**

- A. For purposes of this section “employee” refers to any individual employed or engaged by Contractor or by Subcontractor. If any employee, in the performance of this Contract, has or will have access to a Chicago Department of Water Management facility, the City may conduct such background and employment checks, including criminal history checks and work permit documentation, as the Commissioner of the Department of Water Management and the City may deem necessary, on Contractor, any Subcontractor, or any of their respective employees. The Commissioner of the Department of Water Management has the right to require Contractor to supply or provide access to any additional information the Commissioner of the Department of Water Management deems relevant. Before beginning work on the Project, Contractor must:
- B. Provide the City with a list of all employees requiring access to enable the City to conduct such background and employment checks;
- C. Deliver to the City consent forms signed by all employees who will work on the Project consenting to the City’s and Contractor’s performance of the background checks in this Section; and
- D. Deliver to the City consent forms signed by all employees who will require access to the Department facility consenting to the searches described in this Section.
- E. The Commissioner of the Department of Water Management may preclude Contractor, any Subcontractor, or any employee from performing on the Project. Further, Contractor must immediately report any information to the Commissioner of the Department of Water Management relating to any threat to Department infrastructure or facilities or the water supply of the City and must fully cooperate with the City and all governmental entities investigating the threat. Contractor must, notwithstanding anything contained in the Contract Documents to the contrary, at no additional cost to the City, adhere, and cause Subcontractors to adhere, to any security and safety guidelines developed by

- the City and furnished to Contractor from time to time during the time of performance under this Contract and any extensions of it.
- F. Each employee who Contractor wishes to have access to a Department facility must submit a signed, completed "Area Access Application" to the Department to receive a Department Security Badge. If Contractor wishes a vehicle to have access to a Department facility, Contractor must submit a vehicle access application for that vehicle.
  - G. The applications will solicit such information as the Commissioner of the Department of Water Management in his discretion may require including, name, address, date of birth, social security number (and for vehicles: make, model, driver's license number, vehicle license plate number, and appropriate stickers). Contractor is responsible for requesting and completing these forms for each employee who will be working at Department facilities and all vehicles to be used on the Work site. The Commissioner of the Department of Water Management may grant or deny the application at the Commissioner's sole discretion. Contractor must make available to the Commissioner of the Department of Water Management, within one business day of the request, the personnel file of any employee who will be working on the Project.
  - H. At the Commissioner of the Department of Water Management's request, Contractor and Subcontractors must maintain an employment history of employees going back 5 years from the date Contractor began Work on the Project. If requested, Contractor must certify that they have verified the employment history as required on the form designated by the Commissioner of the Department of Water Management. Contractor must provide the City, at its request, a copy of the employment history for each employee. Employment history is subject to audit by the City.
  - I. Department Security Badges and Vehicle Permits will only be issued based upon properly completed Area Access Application Forms. Employees or vehicles without proper credentials will not be allowed on Department property.
  - J. The following rules related to Security Badges and Vehicle Permits must be adhered to:
  - K. Each employee must wear and display the Department Security Badge issued to that employee on their outer apparel at all times.
  - L. At the sole discretion of the Commissioner of the Department of Water Management and law enforcement officials, including but not limited to the Chicago Police Department, Cook County Sheriff's Office, Illinois State Police or any other municipal, state or Federal law enforcement agency, all vehicles (and their contents) are subject to interior and exterior inspection entering or exiting Department facilities, and all employees and other individuals entering or exiting Department facilities are subject to searches. Vehicles may not contain any materials other than those needed for the Project. The Commissioner of the Department of Water Management may deny access to any vehicle or individual at the Commissioner of the Department of Water Management's sole discretion.
  - M. All individuals operating a vehicle on Department property must be familiar and comply with motor driving regulations and procedures of the State of Illinois and the City. The operator must be in possession of a valid, state-issued Motor Vehicle Operator's Driver's License.
  - N. All required City stickers and State Vehicle Inspection stickers must be valid.
  - O. Individuals must remain within their assigned area and haul routes unless otherwise instructed by the Commissioner of the Department of Water Management or the City.

- P. Access to the Work sites will be shown or designated on the Contract Documents, Drawings or determined by the Commissioner of the Department of Water Management. The Commissioner of the Department of Water Management may deny access when, at the Commissioner's sole discretion, the vehicle or individual poses some security risk to Department.
- Q. Whenever Contractor receives permission to enter Department property in area where exit/entrance points are not secured by the City, Contractor may be required to provide gates that comply with Department design and construction standards. Contractor must provide a licensed and bonded security guard, subject to the Commissioner of the Department of Water Management's approval and armed as deemed necessary by the Commissioner of the Department of Water Management, at the gates when the gates are in use. Department Security will provide the locks. Failure to provide and maintain the necessary security will result in an immediate closure by Department personnel of the point of access.
- R. Stockpiling materials and parking of equipment or vehicles near Department security fencing are prohibited.
- S. Any security fencing, gates, or alarms damaged Contractor or Subcontractors must be manned by Contractor's licensed and bonded security guard at Contractor's expense until the damaged items are restored. Contractor must restore them to their original condition within an 8-hour period from the time of notice given by the Commissioner of the Department of Water Management.
- T. Temporary removal and security fencing, gate, or alarm to permit construction must be approved by the Commissioner of the Department of Water Management, and Contractor must provide a licensed and bonded security guard at the site, approved and armed as deemed necessary by the Commissioner of the Department of Water Management, at Contractor's expense, on a 24-hour basis during the period of temporary removal. Contractor must restore the items removed to their original condition when construction is completed.
- U. Unauthorized hazardous or illegal material, including but not limited to hazardous materials as defined in 49 CFR Parts 100-185 (e.g., explosives, oxidizers, radiological materials, infectious materials), contraband, firearms and other weapons, illegal drugs and drug paraphernalia, may not be taken on Department property. Alcoholic beverages are also prohibited.
- V. All employees and vehicles working near Department facilities must be properly identified. All vehicle passes will be issued to the Contractor by the Commissioner of the Department of Water Management, as required. Contractor, Subcontractors, and employees must return identification material to the Commissioner of the Department of Water Management upon completion of your and their respective Work within the Project, and in all cases, Contractor must return all identification material to the Commissioner of the Department of Water Management after completion of the Project. Final Payment will not be made until all passes issued have been returned to Department Security.

### 1.3 SECURITY COORDINATION

- A. Meet requirements for Department of Water Management security as specified elsewhere in these contract documents. Department of Water Management will decide which Contractor personnel receive badges allowing daily access to the site over the contract period, and which Contractor personnel will only be allowed short term access to the site with a visitor pass. Contractor must conform to the Department of Water Management security requirements without any modification to contract price or contract time.
- B. Background Check Consent Form
  - 1. Contractor must provide Department of Water Management with a completed Background Check Consent Form on the Contractor's letterhead for each Contractor employee, Subcontractor employee and other personnel who will receive Department of Water Management Contractor Badge allowing him/her daily access to the project site over the term of the Contract. A copy of the format of the form is attached. Department of Water Management review and approval of the Consent Form and Contractor personnel use of badges provided shall be in accordance with the requirements for Department of Water Management security as specified elsewhere in these contract documents.
- C. Visitor Authorization Request Form
  - 1. Contractor must provide Department of Water Management with completed Visitor Authorization Request Form for each Contractor employee, Subcontractor employee and other personnel who will receive Department of Water Management Visitor Badge allowing him/her daily access for "short term" access to the project site. Representative of the Commissioner must receive the completed forms at least 48 hours before the visiting individual(s) can receive a visitor pass(es) allowing entry on the site. A copy of the format of the form is attached. Department of Water Management review and approval of the Visitor Authorization Request Form and Contractor personnel use of visitor badges provided must be in accordance with the requirements for Department of Water Management security as specified elsewhere in these contract documents.

END OF SECTION 01 25 00

## SECTION 01 30 00

### HEALTH AND SAFETY PLAN

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION OF WORK

- A. This Section includes the requirements for providing a Health and Safety Plan.
- B. Prevention of accidents on or near the Work is the Contractor's responsibility. The Contractor shall take all necessary precautions to assure the safety of all persons and property during performance of the Work and will protect the Work and adjacent property from damage. The Contractor will conform to all laws and regulations relating to health and safety. The Contractor shall designate a qualified representative responsible for safety.
- C. The Contractor shall at all times be solely responsible for all aspects of safety in connection with the Work, including initiating, maintaining and supervising all safety precautions and plans. The Contractor shall perform the Work or ensure that it is performed, in a manner to avoid risk of injury to persons or damage to property and shall continuously inspect the Work, which includes all of the Contractor's materials, equipment and lower tier subcontractors, to discover the existence of any conditions which impose a risk of bodily injury or damage to property.

##### 1.2 SUBMITTALS

- A. Prior to beginning the Work, The Contractor shall submit for the Commissioner's review, a written Safety Plan, with detail commensurate with the Work. Such Plan shall be prepared by an appropriate health or safety professional and shall describe anticipated hazards and control methods. The Contractor will employ to administer a Safety Plan which provides adequate safeguards for all construction employees, the Commissioner's employees, site visitors, and the public. The Plan's safety measures, policies and standards shall conform to those required or recommended by governmental and quasi-governmental authorities having jurisdiction and by the Commissioner, including, but not limited to, requirements imposed by the Contract Documents.

#### PART 2 – PRODUCTS - (Not Applicable)

#### PART 3 - EXECUTION

##### 3.1 The Safety Plan must include, at a minimum, the following components:

- A. **Training.** The Contractor is responsible for the safety education of their employees. The training must comply with all laws and standards and include

additional training for site supervision. Training must continue through the term of the Contract. The Contractor shall provide copies of training certificates to the Commissioner for all operations, which require such training. These documents must be submitted prior to performing the Work. As a minimum, the following training is required:

1. Supervisor Safety Training – must cover record keeping, incident investigation, OSHA inspections, H&S documentation requirements, and the OSHA 10 hour course for construction.
2. Competent Person Training – each person designated as a competent person shall attend training on that particular operation. Operations requiring a competent person per OSHA requirements include, but are not limited to, trenching and excavation, fall protection, scaffolds, confined space entry, and rigging.
3. Employee Orientation Training – must cover the various safety policies, safety manuals, first aid availability, accident reporting procedures, safety meeting participation, personal protective equipment, and enforcement procedures.
4. Emergency Procedures – must cover notification procedures, evacuation routes, mustering points, and accountability.
5. Safety Meetings – must be conducted weekly with all Subcontractor's onsite personnel. Documentation detailing the subject discussed and signatures of all participants must be kept for each meeting.
6. Hazard Communication Standard – must cover all aspects of the standard including MSDSs, chemicals onsite, labeling and the written program. Annual re-training is required.
7. Lockout / Tagout – must cover each individual piece of machinery or equipment that is to be serviced or altered during this Project.

- B. **Incident Investigation.** The Contractor must report all OSHA recordable injuries and any property damage to the Commissioner immediately (within 1 hour of incident). An incident investigation must be conducted and a complete report issued to the Commissioner within twenty-four (24) hours of incident.
- C. **Emergency Procedures and First Aid/Medical Services.** The Contractor must meet OSHA's first aid requirements and provide at least one (1) onsite employee possessing a current training certification in CPR and First Aid.
- D. **Record Keeping.** Project-specific OSHA 300 and first aid logs must be maintained onsite at all times.
- E. **Personal Protective Equipment.** The Contractor shall provide and inspect all personal protective equipment (PPE). In addition, the Contractor shall enforce the use of PPE by its employees, as specified in the project health



and safety plan. Minimum PPE for the Commissioner projects includes: hard hats, safety glasses, hard soled work boots and high visibility warning vests (meeting ANSI/ISEA 107-2004 standards) when personnel are in proximity to moving equipment. The minimum dress code for the Commissioner projects includes appropriate clothing (long pants and sleeved shirts that must cover torso).

- F. **Competent Person.** The Contractor agrees to provide a competent person onsite at all times during operations which require such according to the OSHA regulations. This person must be experienced in the operation and have received detailed training on the regulations pertaining to the operation. The competent person shall perform a daily inspection of the operation.
  - G. **Housekeeping and Site Services.** The Contractor is solely responsible for housekeeping in their work areas. Good housekeeping is essential for all work performed at any of the Commissioner's sites. The Contractor is responsible to supply drinking water, adequate toilets, washing facilities, fire extinguishers, first aid kits and jobsite posters per OSHA requirements.
- 3.2 The Contractor shall designate a qualified safety representative with responsibility for preventing accidents and implementing and supervising the Safety Plan and other safety programs. The safety representative shall attend all project safety meetings, participate fully in all activities outlined in the Safety Plan and shall devote whatever time is necessary to perform such duties properly.

END OF SECTION 01 30 00

## **SECTION 01 32 33**

### **PRE-CONSTRUCTION VIDEOTAPING OF PROJECT SITE**

#### **PART 1 – GENERAL**

##### **1.1 DESCRIPTION OF WORK**

- A. This Section includes the requirements for televising construction areas prior to the start of construction.

##### **1.2 SUBMITTALS**

- A. The Contractor must provide a DVD of the televised inspection of the construction area(s) prior to the start of any construction. Recordings are to be in high quality color. Printed labels DVD containers and disks must include the contract name and number, date the recording was made, and location of the televised inspection.
- B. A log must be provided detailing all defects and deficiencies within the project limits. The footage from the beginning of recording as well as the approximate street address must be included.

##### **1.3 QUALITY ASSURANCE**

- A. Work is to be performed by a professional video operator having appropriate equipment and significant documentable experience in televising similar construction sites.

#### **PART 2 – PRODUCTS - (Not Applicable)**

#### **PART 3 - EXECUTION**

##### **3.1 GENERAL**

- A. No additional working days will be allowed due to delays in securing the televising services of a private vendor.
- B. All construction areas must be televised within three (3) months of the start of any construction, unless directed otherwise by the Commissioner.

C. Prior to televising, the Contractor must visually inspect all areas to be videotaped and make notations of any features that may not be readily visible during the televising of the area. Identify and record all measurements of such items during the pre-videotape inspection, and include the Information in the narration of the area when it is televised.

D. Any out of focus or distorted audio on any portions of the recording will be cause for rejection of the recording and require re-televising the area in question at the Contractor's expense.

### 3.2 TELEVISIONING PROCEDURE

A. The camera must be moved through the construction area while tracking progress with a measuring wheel at a uniform rate not to exceed 50 feet per minute, stopping when necessary to ensure proper documentation of the condition of the area. Panning and zoom in/out rates are to be controlled to maintain clarity of the documented item(s) during playback.

B. Televising the exterior construction areas during periods of good weather. Avoid televising during periods of poor visibility, precipitation, or times of the year when fallen leaves or snow obscures features in areas to be recorded. Provide auxiliary lighting when required to fill in shadow areas during taping.

C. Televised coverage must include all areas within the zone of influence of the type of construction shown on the drawings, unless directed otherwise by the Commissioner. Audio and video coverage is to be recorded simultaneously.

D. Defects or deficiencies revealed by the televised inspection must be noted on the recording and highlighted by audio commentary. Existing debris and damage to buildings or other structures, paved areas, utility structures, curb, gutter, sidewalk, driveways, aprons and other features must be recorded and audibility noted. Notation shall include the approximate street address as well as distance measured from the start of recording.

### 3.3 RECORDED INFORMATION

#### A. Audio Information

1. Each DVD must begin with the recording date, project name and city department, followed by general location references (i.e. street names, building addresses, viewing side and direction of travel, references to building floor plans, or prominent architectural features), as appropriate for the type of project, unless directed otherwise by the Commissioner. The audio track is to contain the narrative commentary of the camera operator recorded

simultaneously with the fixed elevation video record within the zone of influence of construction.

B. Video Information

1. All video recordings must by electronic means, display the following information continuously and digitally on screen. The information should be positioned on screen so as not to obscure information being videotaped.
  - a. Report or tape number
  - b. Date recorded
  - c. Location reference

END OF SECTION 01 32 33

## **SECTION 01 32 36**

### **TELEVISED INSPECTION OF SEWER MAINS**

#### **PART 1 - GENERAL**

##### **1.1 DESCRIPTION OF WORK**

A. This Section includes requirements for televising the interior of existing city sewers to document the physical condition of the pipe and structures.

1. Televising existing sewer(s) when new water mains are constructed parallel to the existing sewer. Existing sewer(s) should be televised for their entire length through the construction area, starting at a manhole closest to the beginning of the construction area, working upstream, to a manhole closest to the end of the construction area.

B. The following is a list of standards which may be referenced in this section:

1. U.S. Department of Transportation, Federal Highway Administration: Manual on Uniform Traffic Control Devices (MUTCD), Part 6, Temporary Traffic Control.
2. NASSCO: Pipeline Assessment Certification Program (PACP).

##### **1.2 SUBMITTALS**

A. The Contractor must provide two (2) DVDs of the televised inspections for documenting the condition of existing city sewers within the area of construction, or as directed by the Commissioner. The first televised inspection must be made before the start of any water main construction. The second televised inspection is to be made after the water main has been installed and street and parkway restoration has been completed. The location and narration of both the pre-construction and post construction televised inspections must be synchronized by means of narration and an on screen distance meter to enable a comparison to be made to judge the physical condition of the sewer(s) before and after construction.

B. Videotaped inspections must be recorded on a DVD, of such format to be viewed on a PC or multiple-format DVD player in a read only format. All recordings are to be in high quality color. Printed labels on DVD containers and cases must include the name of the water main project, contract number, and date of inspection(s).

### 1.3 QUALITY ASSURANCE

- A. Submit DVDs with logs for quality review and comment to Owner and Engineer within 24 hours after the first days' work has been completed. Submit tapes and logs on a routine basis within seven (7) days after completing each tape. Picture quality and definition shall be to the satisfaction of Owner and Engineer. Inspection equipment that fails to produce satisfactory inspection quality shall be removed.

## PART 2 – PRODUCTS

### 2.1 EQUIPMENT

#### A. Inspection Equipment:

##### 1. Monitoring Studio:

- a. Temperature controlled.
- b. Size: Sufficient to allow seating for two people in addition to operating technician.
- c. Secure cable, chains, and other devices used with camera so as not to obstruct camera view or otherwise interfere with proper documentation of sewer conditions

##### 2. Television Monitor:

- a. Locate in monitoring studio.
- b. Color video picture.
- c. Resolution capability of no less than 350 lines.
- d. Continuous display during survey:
  - 1. Date of survey.
  - 2. Number designation of manhole section being surveyed.
  - 3. Continuous forward and reverse readout of cameral distance from the manhole reference.

##### 3. Cables: 600 feet long, minimum.

##### 4. Power source.

##### 5. Lights.

##### 6. Television Camera:

- a. Explosion proof.
- b. Resolution capability: Minimum of 460 lines of horizontal resolution and 400 lines of vertical resolution.
- c. 360-degree pan and tilt unit, with adjustable supports specifically designed and constructed for operation in connection with pipe inspection. Lights shall be mounted on and turn in the direction of the camera head.

- d. 65-degree viewing angle, minimum, and either automatic or remote focus and iris controls. Remote control adjustment for focus and iris shall be located in the monitoring studio.
- e. Operative in 100 percent humidity conditions.
- f. Mounted on a device, sized for each pipe diameter, that is capable of performing work as described in this section. (Unless some significant impassable condition arises, in which case the contractor must contact the Commissioner for direction on how to proceed.)
- g. Equip with tag line suitable for pulling camera backwards.
- h. Ability to achieve proper balance of tint and brightness.
- i. Equip with winch, power winch, TV cable, powered rewind, or other devices used to move camera through pipe.
- j. Focal Distance: Adjustable through range from 6 inches to infinity.
- k. Camera Lighting:
  - 1. Minimize reflective glare.
  - 2. Remote variable intensity control.
  - 3. Lighting quality to provide clear, in-focus picture of entire inside periphery of pipe.
- l. Sufficient for 6–inch through 72–inch diameters.
- m. Remote Reading Footage Counter:
  - 1. Accuracy: two-tenths of one foot over length of section being inspected.
  - 2. Mounted over television monitor.
  - 3. Marking on cable will not be allowed.
  - 4. Calibration: Each day prior to setup.

## 2.2 RECORDING OF DOCUMENTATION

### A. Media:

- 1. DVD-R.
- 2. DVD disc must be recorded in format compatible with standard DVD video players.
- 3. Opening Screen:
  - a. Date of inspection.
  - b. Pipe structure identification number.
  - c. Upstream and downstream node identification numbers.
  - d. Street address.
  - e. Pipe size.

- f. Normal (upstream to downstream) or reverse (downstream to upstream) pull.
4. Continuous View:
  1. Current distance along reach (tape counter footage).
  2. Do not include pipe structure identification number along active tape (only on opening screen).
5. Audio (voice over):
  1. Description of inspection setup, including related information from log form.
  2. Unusual conditions.
  3. Operation changes (e.g., remove roots and restart inspection at footage prior to root removal).
  4. Verbal (voice over) description and location of each defect.
  5. Verbal description and location of each service connection.
6. DVD Labeling:
  - a. Provide printed label on the inside face of the actual diskette that indicates the following:
    1. Name of Owner.
    2. Project Title.
    3. Date of Inspection.
    4. Inspection Company.
    5. Tape Number.



## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. No additional working days will be allowed due to delays in securing the video inspection services of a private vendor.
- B. The initial video of the sewer(s) must be made within one (1) month of the start of construction, unless directed otherwise by the Commissioner. A second video inspection of sewers must be conducted after all water mains and surface restoration is completed.
- C. Any out of focus video or distorted audio on any portion of the video will be cause for rejection and require a new DVD of the inspection to be submitted at no additional cost to the City.
- D. When non-remote powered and controlled winches are used to pull television camera through line, telephones, radios, or other suitable means of communication shall be provided between the two manholes to ensure that adequate communications exist between crewmembers.

### **3.2 TELEVISION PROCEDURES**

- A. Set camera so axis is at centerline of pipe.
- B. Show continuous footage reading on tape image. Place on screen where it is clearly visible (e.g., if black font, do not place on dark background, if white font, do not place on light background).
- C. Keep camera lens clean, and clear. If material or debris obscures image or causes reduced visibility, clean or replace lens prior to proceeding with recording operation.
- D. Camera lens shall remain above visible water level and may submerge only while passing through clearly identifiable line sags (or vertical misalignments).
- E. Record inside of each lateral, and connection of lateral to pipeline.
- F. Recordings shall clearly show cracks and fractures, and their severity, in addition to obvious features, i.e., laterals and joints.
- G. Immediately report obstructions that restrict flow and cause inspection to be interrupted to Owner or Engineer. Document condition with still photograph, and begin inspections of other pipelines.
- H. Camera Operation:
  - 1. Speed: 30 feet per minute, maximum, during inspection.

2. Stop, for a minimum of 5 seconds, at every lateral, broken pipe, root intrusion, or other defect or adversity.
  3. Pan entire diameter or area of pipe at each defect.
  4. Lens, lighting, and focus shall be readjusted in order to ensure clear, distinct, and properly lighted image of defect.  
televised line and beginning of another.
- I. Insert 5-second blank space between line segments to clearly mark end of one
  - J. Loss of color or severe red or green color will be cause for rejection of inspection.
  - K. Recordings shall be without distortion or outside interference.
  - L. Line segments shall be televised complete from structure-to-structure on same DVD in continuous run. Video must clearly show camera starting and ending at structure, unless defect does not allow it. Do not perform partial televising on one DVD and then complete run on another DVD. If line is partially televised, due to excusable condition, i.e., collapsed line, televised length shall be viewed by Commissioner for acceptability.
  - M. Record all measurements in English units.
  - N. Obtain pipe diameter by physical measurement in upstream (or downstream) access structure.
  - O. Verify pipe material (e.g., RCP, VCP, CMP) and surface lengths between manholes.
  - P. Use calipers or measuring rod to determine diameter of inlet and outlet pipe.
  - Q. Footage measurements shall begin at centerline of upstream manhole, unless Owner or Engineer approves otherwise.
  - R. Continuous Footage Readings:
    1. Use to identify location of defects.
    2. Accurate to within plus or minus 2 percent tolerance.
    3. Defect identifications are to be called out and recorded to the nearest 1 foot.
    4. Line segment recording will be unacceptable if continuous footage meter is inaccurate or identified defects or features leave doubt as to accuracy of locations or total length.
  - S. For measurement of distance to defects, attach marker flag to top of camera yoke. Measurements recorded in log shall be zeroed in alignment with marker rather than camera itself. Measurement shall be zeroed after each segment inspected.
  - T. Check accuracy of measurement meters daily by use of walking meter, roll-a-tape, or other suitable device.

### 3.3 RECORDED INFORMATION FOR SEWER INSPECTIONS

- A. Audio and written documentation must accompany all DVD's submitted to the Commissioner.
- B. The voice narrations on the recording 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 DVD recording(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 DVD container must include location, date, format, and other descriptive reference information.
- D. Work Product:
  - 1. DVD diskettes and completed inspection log sheets,
  - 2. Inspection Log Sheet:
    - a. A single and complete log for each manhole-to-manhole section of pipe will be submitted.
    - b. Provide separate logs for normal and reverse setups of same segment.
    - c. Other data of significance, including those defects listed on table at end of this section shall be recorded on videotape.
    - d. Subject to audits against tapes.

END OF SECTION 01 32 36

## SECTION 01 42 00

### REFERENCES DEFINITIONS & ABBREVIATIONS

#### PART 1 – GENERAL

##### 1.1 FORM OF SPECIFICATIONS

- A. Wherever used in the Specifications, the following terms have the meanings indicated which are applicable to both the singular and plural form of the word.
- B. Where "as shown," "as indicated," and "as detailed," or words of similar import are used, it is understood that reference to the Drawings is made unless stated otherwise. Where "as directed," "as permitted," "approved," or words of similar import are used, it is understood that the direction, requirements, permission, approval, or acceptance of the City is intended unless stated otherwise.

##### 1.2 DEFINITIONS

- A. Addenda: Written or graphic instruments issued prior to the opening of bids, which clarify, modify, or interpret the Contract Documents.
- B. Agreement: The written Contract, which is evidence of the agreement between the City and the Contractor covering the Work.
- C. Arterial Streets: Major streets where special construction techniques may be required by CDOT.
- D. Chief Procurement Officer: The Chief Procurement Officer of the City of Chicago.
- E. City: The City of Chicago.
- F. Water Management or the Commissioner's duly authorized representative.

- G. Completion: All tests performed and accepted, water services transferred, connections made, and abandonment's completed.
- H. Comptroller: The City Comptroller of the City of Chicago or the Comptroller's successor or successors upon whom the Comptroller's duties are transferred.
- I. Contract: The entire and integrated written agreement between the City and the Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.
- J. Contract Documents: The Agreement, Addenda, Contractor's bid, and related documentation when attached as an exhibit to the Agreement, the Notice to Proceed, the Bonds, the General Conditions, the Special Conditions, the Specifications and the Drawings, together with all Written Orders which completely describe the technical requirements of the Project including bid, Contract, and construction procedures.
- K. Contract Notice: A written notice from the Chief Procurement Officer mailed to the Contractor at the address designated in the Contractor's proposal or to such other address as the Contractor may designate in writing as Contractor's official place of business, transmitting to the Contractor an executed copy of the Contract.
- L. Contractor: The person, firm, or corporation with whom the City has executed the Contract, and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Contractor means the Contractor or his authorized representative.
- M. Defective: An adjective which when modifying the word Work refers to Work that is unsatisfactory, faulty, or deficient, in that it does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test, or approval referred to in the Contract Documents, or has been damaged prior to final acceptance.
- N. Department: The City of Chicago Department of Water Management.

- O. Drawings or Plans: The part of the Contract Documents, which shows the characteristics, and scope of the work to be performed and which have been prepared and approved by the Engineer.
- P. Engineer: The Deputy Commissioner of the Bureau of Water Engineering Services or the Deputy Commissioner's duly authorized representative.
- Q. Force Account: The method of payment for extra work performed.
- R. Furnish: Furnish means supply and deliver to the Work area, ready for unloading, unpacking, assembly, installation, and similar operations.
- S. Install: Install means the actual unloading, packing, assembly, erection, constructing, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- T. Municipal Code: The Municipal Code of the City of Chicago.
- U. Neat Lines: The required clear width of a trench or excavation. In sheeted trenches, the required width is measured to the outside of the sheeting. Unless noted elsewhere on the Plans, neat line clear width is equal to:
1. The sum of the outside diameter of the pipe plus 2-feet for water main construction,
  2. The sum of the outside diameter of the pipe plus 8-feet for sewer construction.
  3. The sum of the outside diameter or edge plus 4-feet for structure construction
- V. Notice to Bidders: The advertisement for bids, the official notice inviting bids for the work to be done.
- W. Product Data: Illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate a material, product, or system for some portion of the Work.

- W. Project: The total construction of which the Work to be provided under the Contract Documents may be the whole, or a part as indicated elsewhere in the Contract Documents.
- X. Provide: Furnish and Install as required.
- Y. Samples: Physical examples which illustrate materials, equipment, or workmanship and establish standards by which the Work will be judged.
- AA. Shop Drawings: All drawings, diagrams, illustrations, brochures, schedules, and other data, which are prepared by the Contractor, Subcontractor, manufacturer, supplier, or distributor, which illustrates how specific portions of the Work are proposed to be fabricated or installed.
- BB. Site and/or Work Area: The lands and other places on, under, in, or through which the Work is to be executed or carried out and any other lands or places provided by the City for the purposes of the Contract, together with such other places as may be specifically designated in the Contract Documents as forming part of the Site and/or Work Area.
- CC. Specifications: A part of the Contract Documents consisting of written descriptions of a technical nature of materials, equipment, construction systems, standards, and workmanship.
- DD. State: The State of Illinois.
- EE. Subcontractor: An individual, firm, or corporation having a direct contract with the Contractor or with any other Subcontractor for the performance of a part of the Work at the Site. The term Subcontractor is referred to throughout the Contract Documents as if singular in number and masculine in gender and means a Subcontractor or his authorized representative.
- FF. Supplier: Any person, supplier, or organization who supplies materials or equipment for the Work, including that fabricated to a special design, but

who does not perform labor at the Site. A supplier is not a Subcontractor who purchases an item or equipment from a manufacturer or supplier.

GG. Unit Price: A cost per unit of work or measurement of material, for a bid item.

HH. Work: All labor necessary to produce the construction required by the Contract Documents, and all materials and equipment incorporated or to be incorporated in such construction. Work is also used to mean the same as Project.

II. Written Order: A directive, written and signed by the Commissioner, delivered to the Contractor at the address designated in the Contractor's bid or to such other address as the Contractor may designate in writing as Contractor's official place of business.

### 1.3 CITATION OF OTHER SPECIFICATIONS

A. Commonly used abbreviations have the meanings as specified in this Section. The plans may contain a list of additional abbreviations applicable thereto. Whenever the Contract Documents refer to the specifications of any society, institute, association, or governing organization, the specifications cited will become a part of this Contract as if written herein in full.

### 1.4 ABBREVIATIONS

- A. AASHTO: American Association of State Highway & Transportation Officials.
- B. ACI: American Concrete Institute.
- C. AISC: American Institute of Steel Construction.
- D. ANSI: American National Standards Institute.
- E. APWA: American Public Works Association.



F. <u>ASCE</u> :	American Society of Civil Engineers.
G. <u>ASME</u> :	American Society of Mechanical Engineers.
H. <u>ASTM</u> :	American Society for Testing and Materials.
I. <u>AWS</u> :	American Welding Society.
J. <u>AWWA</u> :	American Water Works Association.
K. <u>CCD</u> :	Chicago City Datum.
L. <u>CDOT</u> :	City of Chicago Department of Transportation.
M. <u>CRSI</u> :	Concrete Reinforcing Steel Institute.
N. <u>FS</u> :	Federal Specification Board.
O. <u>IDOT</u> :	Illinois Department of Transportation.
P. <u>IEPA</u> :	Illinois Environmental Protection Agency.
Q. <u>ISO</u> :	Insurance Services Office of Illinois.
R. <u>MWRD</u> :	Metropolitan Water Reclamation District of Greater Chicago.
S. <u>NBFU</u> :	National Board of Fire Underwriters.
T. <u>NBS</u> :	National Board of Standards.
U. <u>NCMA</u> :	National Concrete Masonry Association.
V. <u>NCPWB</u> :	National Certified Pipe Welding Bureau.
W. <u>NEMA</u> :	National Electric Manufacturers Association.

- X. NPT: National Pipe Thread.
- Y. OSHA: Occupational Safety and Health Act.
- Z. PCA: Portland Cement Association.
- AA. SSRBC: Illinois Department of Transportation, Standard Specifications for Road and Bridge Construction.
- BB. UL: Underwriters' Laboratory.

**PART – 2 – PRODUCTS – (NOT APPLICABLE)**

**PART - 3 – EXECUTION – (NOT APPLICABLE)**

END OF SECTION 01 42 00

## **SECTION 02 60 00**

### **SPECIAL SOILS EXCAVATION AND DISPOSAL**

#### **PART 1 – GENERAL**

##### **1.1 DESCRIPTION OF WORK**

- A. This Section includes the requirements for the excavation and disposal of soil classified as Special Soils Waste within the limits shown on the drawings.
- B. Soil Borings – The Department will provide Soil Boring logs and laboratory analysis summary tables, when available, for Contractor information only. This information is not part of the Contract Documents but is included for Contractor information only.

##### **1.2 WORK OF THIS SECTION SPECIFIED ELSEWHERE**

- A. Section 31 23 19 – Dewatering Excavations.

##### **1.3 DEFINITIONS**

- A. Special Soils Waste - excavated soil containing contaminants that exceed the most stringent Tier 1 Soil Remediation Objectives for Residential Properties in Illinois Administrative Code (IAC), Title 35, Section 742, Appendix B, Table A. Such soils may contain gasoline, petroleum products, polynuclear aromatic substances (PNAs), and heavy metals such as mercury, chromium and similar metals.

##### **1.4 SUBMITTALS**

- A. Work Plan
  - 1. Submit a Work Plan for the removal of Special Soils Waste from designated areas as shown on the Drawings. Work Plan must be submitted to the Commissioner within thirty (30) days of start of excavation operations.
  - 2. The Work Plan must provide a list of all proposed subcontractors, indicating the service each is to provide. The Contractor and subcontractors must provide a Statement of Qualifications demonstrating their capabilities to provide services as indicated in the Work Plan.
  - 3. The Work Plan must describe the intended dust control measures for the removal of Special Soils Waste.

B. Documentation

1. Provide the Commissioner with copies of all environmental permits, records and reports as specified. The Contractor must provide the Commissioner with the results of any laboratory analyses necessary for permit acquisition.

C. Health and Safety Plan

1. The Contractor must develop a location specific Health and Safety Plan and submit the plan to the Commissioner a minimum of two weeks before beginning construction activities. The Contractor has full responsibility for health and safety on the Site.

D. Report

1. At the end of the Work, prepare a technical report on the activities conducted during the duration of the Work and submit three copies to the Commissioner. The technical report must include all pertinent information regarding the Work including, but not limited to:
  - a. Measures taken to monitor, handle, and dispose of Special Soils Waste Soil, prevent further migration of contaminants and to protect workers.
  - b. Cost for monitoring, handling, and disposing of special soils waste soil.
  - c. Reduced scale drawing(s) showing area(s) of Special Waste Soil removed.
  - d. Contractors and subcontractors hourly records broken down by project.
  - e. Waste manifests and/or landfill tickets (identified by project) for Special Soils Waste disposal.

1.5 PERMITS AND FEES

- A. The Contractor must include in his unit price bid the cost associated with obtaining all permits and landfill disposal fees required for disposal of special soils waste.

**PART 2 - PRODUCTS - (NOT APPLICABLE)**

**PART 3 - EXECUTION**

3.1 DUST CONTROL.

- A. Contractor must control and minimize the release of dust during Special Soils Waste removal activities, by use of water or an acceptable chemical application.

### 3.2 EXCAVATION AND DISPOSAL.

#### A. Restrictions

1. Soil and other material removed from an excavation determined to have Special Soils Waste must not be reused and placed as trench backfill material, unless directed otherwise by the Commissioner.

#### B. Dewatering

1. Dewater excavations in accordance with Section 31 23 19 – Dewatering Excavations.

#### C. Backfill Plugs

1. When excavation occurs in areas with a high groundwater table and excavated material has been classified as Special Soils Waste, the Contractor must install backfill plugs to isolate the area from the remainder of the excavation. Backfill plugs must be installed at intervals not to exceed 50 feet, and must be a minimum of 4 feet in length (measured parallel to the trench), and of full width and depth of the trench. Plugs must be constructed only from non-porous materials such as clay soils, concrete, or equivalent material approved by the Commissioner.

#### D. Transporting and Disposal of Special Soils Waste.

1. Due care must be used by the Contractor in transporting Special Soils Waste material from the area of origin to the disposal area. The Contractor is responsible for the clean-up of any release of soil containing contaminants into the environment, at no additional cost to the City. Clean up includes, but is not be limited to, sampling beneath the material staging area to determine complete removal of the spilled material.
2. Transport and dispose of all material classified as a Special Soils Waste from the job site to an appropriately permitted landfill facility. Prepare all manifests required for the transport of Special Waste.
3. Line the equipment used to haul Special Soils Waste material to the landfill facility with a six (6) mil polyethylene liner and provide secure cover during transportation. The Contractor must obtain all documentation including any permits and/or licenses required to transport the Special Soils Waste material to the disposal facility.
4. Make all arrangements for testing and waste disposal approval with the disposal facility. Subsequent to the Contractor completing these activities and upon receipt of authorization from the Commissioner, the Contractor must initiate the disposal process.
5. Schedule and arrange the transport and disposal of each load of Special Soils Waste material produced. Make all transport and disposal arrangements to ensure no Special Soils Waste material remains within the

Work area at the close of business each day. The Contractor is responsible for all other pre-disposal/transport preparations necessary on a daily basis to accomplish management activities.

### 3.3 TEMPORARY STAGING

- A. Excavate and dispose of all waste material without temporary staging. If circumstances require the use of temporary staging, the Contractor must request approval from the Commissioner.

END OF SECTION 02 60 00

## **SECTION 05 10 00**

### **STRUCTURAL AND MISCELLANEOUS STEEL**

#### **PART 1 - GENERAL**

##### **1.1 DESCRIPTION. OF WORK**

- A. This Section includes requirements for structural and miscellaneous steel, including all ferrous metals, whether wrought, rolled, fabricated or assembled, except construction castings (frames, grates, solid lids, & steps), pipe (ductile or steel) and steel plates. The classification includes steel angles and bracing, steel sheet piling, inserts, pins, bolts, nuts, washers, and similar items used for constructing temporary or permanent supports for excavations or work specified in other sections of this specification.

##### **1.2 REFERENCES**

- A. American Society for Testing and Materials (ASTM), latest edition:
  - 1. AISC Manual of Steel Construction, Volumes I & II.
  - 2. ASTM A36 - Carbon Structural Steel.
  - 3. ASTM A276 - Stainless Steel Bars and Shapes.
  - 4. ASTM A283 - Low and Intermediate Tensile Strength Carbon Steel Plates.
  - 5. ASTM A307 - Carbon Steel Bolts and Studs.
  - 6. ASTM A328 - Steel Sheet Piling.
  - 7. ASTM A572 - High Strength Low Alloy Columbium-Vanadium Structural Steel.

##### **1.3 SUBMITTALS**

- A. Refer to Book I for submittal requirements and procedures for Shop Drawings, Product Data, Records and Samples.
- B. Complete data on date of manufacture dates of initial installation and extraction, and service for used sheet piling, must be furnished to the Commissioner for all sheet piling used in the Work.

#### **PART 2 - PRODUCTS**

##### **2.1 STRUCTURAL AND MISCELLANEOUS STEEL**

- A. Structural and miscellaneous steel must meet the requirements of the following standards, except as specified otherwise:
  - 1. Structural Steel Shapes and Plate - ASTM A36
  - 2. Mild Steel Plate - ASTM A283

3. Standard Bolts - ASTM A307
4. Steel Sheet Piling - ASTM A328, A572 Grades 45, 50 and 55
5. Stainless Steel Anchor - ASTM A276 Bolts Type 304

## 2.2 BOLTS AND NUTS

- A. Bolts and nuts must be of the best quality mild steel, except where bronze, aluminum, stainless steel, or other materials are shown or required.
- B. Bolts must have hexagonal nuts.
- C. Threads must be clean cut of American Standard size.

## 2.3 SHEET STEEL PILING

- A. All piling must be new or good quality used material approved by the Commissioner.
- B. All sheet piling must be true and straight with undamaged interlocks or ends.
- C. Used sheet piling must have been driven only one (1) time before being offered for use on this project.
- D. Used sheet piling must be made available for inspection by the Commissioner before it is shipped to the job Site.

## 2.4 ANCHORS

- A. Anchors must be designed for rigid fastening to the structures, whether directly or through brackets.
- B. The design of all anchors is subject to the approval of the Commissioner.
- C. Anchors for piping must be of the cast iron chair type with steel straps, except where anchors form an integral part of pipe fitting, or where an anchor of special design is required.

## 2.5 INSERTS

- A. Inserts must be designed to permit the rods to be adjusted horizontally in one (1) plane and to lock the rod nut or head automatically.
- B. Inserts must be recessed near the upper flange to receive reinforcing rods.
- C. Inserts must be so designed that they may be held in position during concrete pouring operations.



- D. Inserts must be designed to carry safely the maximum load that can be imposed by the rods, which they engage.
- E. Inserts for concrete must be galvanized.

### **PART 3 - EXECUTION**

#### **3.1 FIELD QUALITY CONTROL**

- A. The design, workmanship, and erection must conform to the requirements of the AISC Specifications for Design, Fabrication, and Erection of Structural Steel for Buildings, unless otherwise shown, specified, or required.
- B. The Contractor is responsible for the correctness of all shop and field fabrication and fit. Members must be straight, must fit closely together, and the finished work must be free from burrs, twists, bends, and open joints.
- C. Where shop assembly of field connections is shown, specified or required, the unmatched holes must be reamed and the pieces match marked before disassembly. No drifting will be allowed.
- D. In case the eccentricity is too great for good work or the strength of the joint is liable to be weakened by reaming, the piece will be rejected and a new satisfactory one must be provided at the Contractor. This process is considered incidental to the construction and no additional payment will be allowed.

#### **3.2 FIELD CONNECTIONS**

- A. Weld or bolt all field connections as hereinafter specified unless riveted connections are approved by the Commissioner.

#### **3.3 WELDING**

- A. Welding must be performed by qualified welders in accordance with the requirements of the AISC Specifications.
- B. In assembling and during welding, the component parts of built-up members must be supported and held by sufficient clamps and other adequate means to hold the parts in proper relations for welding.

#### **3.4 STEEL SHEET PILING**

- A. Drive steel sheet piling to depth as shown, or as approved by the Commissioner.
- B. Drive all sheet piling plumb and tight to the lines and grades shown and as directed.
- C. The driven sheet piling must be stiffened horizontally, as necessary to meet the requirements of Section 31 23 10 – Excavation, Trenching and Backfilling.

### 3.5 NUTS, BOLTS, AND ANCHORS

- A. Anchors must be furnished and installed when specified, shown, or required for holding the pipelines and equipment in position or alignment.
- B. Set anchor bolts accurately set to maintain elevation and location, and if placed after concrete is cast, all necessary drilling and grouting must be considered incidental to the construction process and no additional payment will be allowed.
- C. Coat anchor bolt threads heavily with grease while concreting.
- D. Bolt anchors must be of the sizes indicated or approved and must be of the self-drilling type.
- E. All anchor bolts and nuts submerged or subject to periodic wetting must be of stainless steel unless shown or specified otherwise.

### 3.6 INSERTS

- A. Install inserts in the concrete structures where required for fastening supporting devices.

END OF SECTION 05 10 00

## **SECTION 31 23 10**

### **EXCAVATION, TRENCHING AND BACKFILLING**

#### **PART 1 – GENERAL**

##### **1.1 DESCRIPTION. OF WORK**

This specification includes the requirements for excavation, bedding, backfilling and compaction, of utility trenches for water and sewer mains and associated appurtenances.

##### **1.2 WORK OF THIS SECTION SPECIFIED ELSEWHERE**

- A. Section 01 55 26 - Traffic Control and Regulations.
- B. Section 02 60 00 - Special Soils Excavation and Disposal.
- C. Section 05 10 00 - Structural Steel and Miscellaneous Metal.
- D. Section 31 23 19 - Dewatering Excavations.
- E. Section 32 90 00 - Landscape Restoration.

##### **1.3 REFERENCES**

- A. CDOT Regulations for Openings, Construction and Repair in the Public Way (CDOT Specifications), latest edition.
- B. IDOT Standard Specifications for Road and Bridge Construction (SSRBC), latest edition.
- C. IDOT Supplemental Specifications and Recurring Special Provisions (SSRSP), latest edition.
- D. ASTM D1557 - Laboratory Compaction Characteristics of Soil, latest edition.
- E. Department of Labor, Occupational Safety and Health Administration 29 CFR Part 1926, Occupational Safety and Health Standards – Excavations; Final Rule (OSHA), latest edition.

##### **1.4 DEFINITIONS**

- A. Soil types are defined as follows.
  - 1. Trench Excavation. Excavation of soil for the purpose of installing water and sewer mains, their appurtenances, and for the restoration of surface features. The excavated material may be classified as either clay or sandy soil, a mixture of each, and may contain varying amounts of loam, silt, gravel, organic material, or rock fragments less than one (1) cu yd in volume. Trench excavation excludes all material defined as Rock Excavation and Unsuitable Soil.
  - 2. Rock Excavation. Excavation of naturally occurring deposits of limestone, sandstone, shale or other indigenous rock occurring as bedrock, rock ledges, outcroppings, or boulders, one (1) cu yd or larger in volume necessitating removal by the use of systematic drilling, expansive jacks, or backhoe mounted pneumatic hole punchers or rock breakers.

3. Unsuitable Soil Materials. This soil material includes varying amounts of material classified as slag, cinders, trash, debris and rubble; organic or contaminated soil and material; asphalt and concrete pavements (including aggregate sub-base); sidewalks and curbs; concrete slabs concrete or masonry foundations; metal beams, bracing, and sheet piling; or similar matter.

## 1.5 SUBMITTALS

- A. Submittal requirements and procedures for Shop Drawings, Product Data, Records and Samples must be submitted in accordance with Book I – Terms and Conditions for Construction, latest edition, issued by the City of Chicago, Department of Procurement Services.
  - B. Provide to the Commissioner copies of all contractual agreements, permits and / or licenses for proposed disposal sites for all material and waste removed from the job site.
  - C. Shop Drawings and supporting calculations for excavation support systems must be submitted to the Commissioner for review and approval.
1. Excavation Support Systems:
    - a. Prepare and submit a written schedule and procedure, along with detailed drawings, of the proposed excavations and excavation support systems.
    - b. Include installation procedures; method of concrete placement; excavation sequence; interface details; protection measures for existing structures and facilities; instrumentation and monitoring procedures to check performance, sequence, and method of removal; and contingency plans for excessive wall or foundation movements.
    - c. The program must take into account that excavations cannot extend beyond the right-of-way into adjacent properties above or below grade, unless otherwise indicated. Where Contractor requires the installation of part of excavation protection system on private property, the Contractor will be solely responsible for securing permission from adjacent property owners to install such temporary and permanent systems.
      - i. Any such permission from adjacent property owners must be in writing, and the owner's signature, granting such permission, must be witnessed and properly notarized. Certified copies of all such permissions must be submitted to the Commissioner for record purposes.

2. Shop Drawings: Submit Shop Drawings and specifications for support systems, lagging, and internal bracing. Include the following:
    - a. Specific Description. of field quality control measures.
    - b. Details of interface with permanent structures.
    - c. Details of bracing struts and wales, if used, and the proposed installation procedures, including method and sequence of preloading.
    - d. Details of required preloading systems, pre-stressing systems, load measuring facilities, systematic schedule of preloading and pre-stressing operations, and sequence of construction.
    - e. Method and details for securing lagging in support system openings.
    - f. Proposed method of providing for utility penetrations.
    - g. Assembly and erection details of members and connections for the system.
  3. Plating of Excavations: When requested submit design calculations stamped by a Structural Engineer Licensed in the State of Illinois as proof of the structural integrity of the plating provided.
  4. Calculations: Submit appropriate design calculations to support Shop Drawings. Include maximum theoretical deflections of supporting members. Include calculations indicating the expected magnitude of vertical and lateral movement.
  5. Professional Engineer's Certification: The excavation support systems program, Shop Drawings, calculations, and test reports must be prepared, sealed, and signed by a professional structural engineer currently registered in the State of Illinois.
    - a. Where CTA/METRA or other private railroad company approval for excavation support or shoring is required, submit calculations and related documents prepared, signed, and sealed by a professional structural engineer currently registered in the State of Illinois.
- D. The Contractor, before starting work, must submit to the Commissioner for approval, a layout of his construction procedures and the equipment to be used in maintaining the trees in place without damage.
- E. Provide for CLSM (Flowable Fill) backfill quality control (QC) and quality assurance (QA) in accordance with the IDOT SSRSP, Check Sheet #25 "Quality Control Quality Assurance of Concrete Mixtures".

## **PART 2 – PRODUCTS**

### **2.1 GENERAL**

- A. Pipe bedding and trench backfill material must conform to the requirements and gradation specified in Section 1003, Fine Aggregates (FA), or Section 1004, Coarse Aggregates (CA), of the SSRBC.
- B. Coarse Aggregate (CA) material classified, as Chert or Novaculite Gravels, or Slag from any source, are not permitted for use as bedding or backfill material.
- C. Fine Aggregate (FA) material classified as Silica Sand, Slag Sand from any source, or Construction Debris Sand, are not permitted for use as bedding or backfill material.
- D. All material must be dry and free of organic matter, clay, garbage, paper, wood or similar material, boulders or large particles of frozen material.

### **2.2 PIPE BEDDING**

#### **A. Pipe Bedding for Water Main Construction**

Coarse aggregate (CA) material classified, as washed Crushed Limestone or Stone must conform to gradation CA-16 for water mains 16 inches in diameter or smaller, CA-11 for water mains larger than 16 inches in diameter, unless otherwise authorized by the Commissioner.

#### **B. Pipe Bedding for Sewer Main Construction**

Coarse aggregate (CA) material classified, as crushed gravel, crushed stone or crushed concrete must conform to gradation CA-11, unless directed otherwise by the Commissioner.

### **2.3 BACKFILL MATERIAL**

#### **A. Backfill Material for Water Main Construction**

- 1. Coarse aggregate (CA) material classified as washed Crushed Limestone or Stone conforming to gradation CA-16 or the 1/4" Limestone Chips gradation in accordance with the following Table A – Gradation of Trench Backfill Material, unless authorized otherwise.

**TABLE A**  
**GRADATION OF TRENCH BACKFILL MATERIAL**

<b>US SIEVE SIZE</b>	<b><u>1/4" Limestone Chips % Passing By Weight</u></b>
1/2"	100
3/8"	100
1/4"	96
#4	64
#10	4
#16	2

**B. Backfill for Sewer Construction**

1. Fine aggregate (FA) material classified as sand, crushed concrete sand or stone sand must conform to gradation FA 6 unless directed otherwise by the Commissioner.

**C. Controlled Low Strength Material, CLSM (Flowable Fill Material)**

1. Materials for Flowable Fill must meet requirements of IDOT SSRBC Sections 593 and 1019 for Controlled Low Strength Material, CLSM.
  - a. Flowable fill material placed adjacent to water mains must be of a non-fly ash type mix design, mix # 2.

**2.4 GEOTEXTILE FABRIC**

- A. Geotextile fabric must be Fabric for Silt Filter Fence and must conform to the requirements of Article 1080.02 in the SSRBC.

**2.5 AGGREGATE FOR STABILIZATION OF TRENCH BOTTOMS**

- A. When required aggregate used to stabilize trench bottoms must have an aggregate such that the majority of the material passes a 1½ to 2½-inch sieve, with no more than 10% of the material passing the No. 16 sieve. The quality of the aggregate must meet requirements established for aggregate bedding.

**PART 3 - EXECUTION**

**3.1 WORK AREA PREPARATION**

**A. Existing Work Area Condition**

1. All information on subsurface exploration available to the Department, if any, will be made available to the Contractor for examination. However, the

Department in no way takes responsibility for, the interpretation, accuracy, or thoroughness of the information. It will be the responsibility of the Contractor to make such subsurface explorations as deemed necessary, to supplement information provided by the Department, at no additional cost to the Department.

2. Prior to excavating, thoroughly investigate the limits of the proposed trench to ascertain the existence and location of any underground structures, existing utilities or other items that might interfere with the pipe installation. Notify the Commissioner of any obstructions that will prevent the installation of the pipe or appurtenances as indicated on the Drawings.

B. Clearing Work Area

1. Before starting trench excavation, all obstructions, which must be removed or relocated, must be cleared. Pavement, curbs, walks, trees, shrubs, utility poles, and other structures, which are to be preserved, must be properly braced and protected. Unless otherwise shown or directed by the Commissioner, all trees and large shrubs must be preserved with minimal damage inflicted on the root structure. When required, small trees and shrubs may be removed and replaced with equivalent specimens if approved in advance by the Commissioner.

C. Segregation and Disposal of Soil Material

1. Topsoil suitable for final grading and landscaping, and excavated material suitable for backfilling, as described in Section 32 90 00, - Landscape Restoration, may be stockpiled separately within the Work Area if approved by the Commissioner.
2. Surplus excavated material and excavated material unsuitable for backfilling, final grading, and landscaping, must be transported off of the Site and disposed of in disposal areas obtained by the Contractor and approved by the Commissioner.
3. Excavated material must not be stockpiled along the route of the work unless authorized beforehand by the Commissioner.

D. Pavement Removal

1. The Contractor must saw cut all concrete and asphalt pavements to their full depth prior to breaking and removing the pavement. On pavements consisting of an asphalt overlay on a concrete base, the Commissioner reserves the right to order the removal of up to 6 additional inches beyond the edge of the concrete base. This additional asphalt removal must be removed to a neat saw cut edge and will be considered incidental to the Work.
2. Utilizing drop weight equipment for the purpose of breaking the pavement is not permitted.

E. Protection or Removal of Existing Trees



1. Comply with CDOT Specifications Chapter 4, "Excavation Pavement Removal" for protection of trees, shrubs, and other improvements.
2. The Contractor is not permitted to remove trees beyond the limits of the trench excavation except as specified in these Specifications, or as shown on the Plans, or as ordered by the Commissioner.
3. The Contractor must arrange his construction operations and use the necessary equipment required, so as not to remove or damage any existing trees due to the Work to be performed under this Contract.
4. To protect the trunks of existing trees from damage, the Contractor must place 2" x 4" boards, six (6) feet long, vertically and about 6 inches apart around all trees located in the parkways along the route of the work. The boards must be held in place by wire looped around the circumference of the tree trunk. After completion of all work, the protective boards and wires must be carefully removed.
5. Any pruning of trees and roots required to permit the operation of the Contractor's equipment must be kept to a minimum, subject to the approval of the Commissioner, and must be done symmetrically by a licensed arborist. The arborist is required to obtain a permit from the City of Chicago, Bureau of Forestry, Plans and Permits Section of the Department of Streets and Sanitation, to trim and spray or in any way affect the general health or structure of trees in the public way. Prior to this approval, the Bureau will conduct an investigation at the sites of the proposed sewer. They will work with the Resident Engineer and the Contractor, and request 48-hour notice prior to starting any tree work.

F. Trench Excavations Over 12-feet Deep

1. Comply with CDOT Specifications Chapter 4, "Excavation Pavement Removal" for trenches over twelve (12) feet deep.

G. Excavating Over or Adjacent to Existing Utilities

1. The Contractor must verify the location of existing utilities in the vicinity of the work before starting construction. The Contractor is responsible for protecting, and repairing utilities damaged by the work under of this contract, at no additional cost to the City. The Contractor must coordinate all work with the owner of the utility.

H. Erosion Control

1. Install geotextile fabric under each storm inlet, catch basin and sewer manhole cover to prohibit dirt, debris and backfill material from entering the sewer system, but to permit drainage. The geotextile fabric is to be maintained until restoration is completed. After restoration is completed, remove the geotextile fabric.

## I. Plating of Excavations

1. Unattended excavations in public streets, alleys, driveways, and walkways necessitated by the work must be plated, if the excavation has not been backfilled, or a temporary paved surface has been provided, or specifically authorized otherwise by the Commissioner.
2. Steel Plate(s) must be large enough to safely span the excavation with sufficient overlap beyond the edge of the excavation to provide firm support as appropriate for the type of pavement and soil encountered. Plate(s) must be firmly bedded and secured to the adjacent pavement to prevent rocking or movement, and of adequate thickness to carry anticipated loads. When plating is left in place during off-work periods, or if the Commissioner feels vehicular or pedestrian safety may be compromised, a bituminous ramp is to be provided at the perimeter of the plate(s) as appropriate to provide a smooth transition between the surface of the plate(s) and the adjacent pavement or walkway.
3. Plating subjected to vehicular traffic must be capable of carrying AASHTO H-20 traffic loading without movement or excessive deflection. The plating must be secured to the adjacent paved surface in such manner so as to prevent rocking or other movement which could expose the excavation. The name of the Contractor must be indicated on both sides of the plating.
4. When steel plates are used and left in place beyond normal working periods, a bituminous ramp must be provided at the perimeter of the plate(s), to provide a smooth transition between the surface of the plate(s) and the adjacent street pavement or walkway, unless authorized otherwise.
5. Plating of excavations is not intended as a substitution for providing traffic control, which must be provided in accordance with Section 01 55 26 of these specifications.

## J. Protection of Existing Water Main from Contamination

Protect existing water mains from contamination by groundwater, dirt, debris, or other foreign material:

1. Prevent groundwater and surface water, dirt, debris, and other foreign material from entering the open pipe.
2. Provide water tight temporary closure of pipe before leaving work site at the end of the work day.
3. Equipment, cables, hoses, supports and all appurtenant equipment placed in the water main must be thoroughly cleaned of dirt and debris, and disinfected with chlorine solution with a chlorine concentration of at least fifty (50) parts per million.
4. Workers entering pipe must wear clean temporary disposable coveralls.
5. Install foot bath and brush and have workers entering the pipe clean footwear with chlorine solution with a chlorine concentration of at least fifty (50) parts per million.

## 3.2 EXCAVATION PROTECTION

#### A. General Requirements

1. Excavations must be protected in accordance with applicable rules, laws and regulations of Federal, State and City ordinances applicable to underpinning, shoring of excavations, and other work affecting adjoining property and the safety of worker, but must not be less than the standards and regulations established by OSHA.
2. Structural support systems are required for all excavations exceeding five (5) feet in depth. Structural support systems are to be used in all excavations in soils that are determined to be unstable or subject to cave-ins, regardless of the depth of the excavation.
3. Protective systems for any excavation exceeding ten (10) feet in depth must be designed and approved by an Structural Engineer licensed in the state of Illinois.
4. The Contractor must remove and replace, or provide the means to support any surface features when their location poses a hazard to workers in the excavation.
5. Whenever excavations cross the location of an existing underground utility, the Contractor must proceed with caution and use appropriate methods of excavation to avoid damaging the utility. The Contractor is responsible for coordinating all work with the owner of the utility.
6. Ramps, runways or ladders must be provided for ingress and egress by workers from excavations exceeding four (4) feet in depth in accordance with OSHA.
7. Surface or ground water entering excavations must be controlled by the use of appropriate equipment. If the trench interrupts the natural flow of surface water, diversion ditches or dikes must be used.

#### B. Protection of Adjacent Structures

1. When the stability of adjoining buildings, walls, sidewalks, pavements or other structures are endangered by the excavation operations, structural support systems such as shoring, bracing or underpinning must be used to ensure the stability of the structure.
2. The Contractor is responsible for posting and issuing all notices required to inform adjacent or adjoining property owners or other parties and such notice or notices must be served in sufficient time as not to delay the progress of the Work under this Contract.
3. Excavation below the foundation of an adjacent structure requires either of the following:

- a. A Structural Engineer or Professional Engineer licensed in the state of Illinois has determined that the structure is located far enough away from the excavation so as to be unaffected, or
- b. A Structural Engineer licensed in the state of Illinois has designed and approved a structural support system to provide adequate protection to the existing structure.

C. Structural Support Systems

Structural support systems may consist of pre-engineered systems such as aluminum hydraulic shoring, trench shields, trench boxes, or systems constructed on the job site such as timber or steel shoring or steel sheet piling.

1. Pre-Engineered System

- a. Pre-engineered structural support systems installed in accordance with the manufacturer's recommendations do not require certification by a Structural Engineer when trench depth is less than twenty (20) feet. However, the Commissioner, at his sole discretion, may require a manufacturer's certification indicating the support system is suitable for the intended use and site conditions.
- b. Pre-engineered structural support systems will require analysis and certification by a Structural Engineer licensed in the state of Illinois, when trench depth exceeds twenty (20) feet.

2. Site Constructed Systems

- a. Construct steel sheet piling system in accordance with Section 05 10 00 – Structural Steel and Miscellaneous Metal.
- b. Structural support systems built in place and made of timber constructed in accordance with OSHA Standards, do not require certification by a Structural Engineer licensed in the state of Illinois, provided trench depths shown in the OSHA Standard, relative to the soil type at the site, are not exceeded.
- c. If the OSHA Standard is not followed for timber shoring and the depths of trenches exceed those in the tabulated data; or soil conditions have been determined to be substantially different than those given in the OSHA Standard; the design must be performed and certified by a Structural Engineer licensed in the state of Illinois.

- d. A structural support system built in place and consisting of materials other than a timber shoring systems will require design and certification by a Structural Engineer licensed in the state of Illinois.
  - e. When close-sheeting is used, it must be driven so as to prevent adjacent soil from entering the trench either below or through such sheeting. Tight-sheeting must be used in that portion of the excavation in or along streets or alleys below the intersection of a 1 to 1 slope line from the nearest face of the excavation to the edge of the pavement.
  - f. Sheetting must not be in contact with existing pavement but must bear uniformly against the sides of the excavation.
3. Where structural support systems, such as steel or wood sheeting are used for stabilizing excavations, the width of the trench may be increased as necessary to accommodate installation of the work. When soils in the lower limits of the excavation have been determined to have adequate stability; the Contractor may end the shoring elements above the bottom of the excavation. If soil begins moving into the excavation below the shoring during construction, the Contractor is solely responsible for making corrections to the excavation and for lowering the shoring, at his own expense.
  4. When structural support systems are required to be left in place, they must be cut off at the same elevation as the bottom of the water main, unless otherwise directed by the Commissioner. Bracing that is to remain in place must be driven up tight. The right of the Commissioner to request sheeting and bracing to be left in place, is not meant to construe any liability or obligation on behalf of the Commissioner to issue such orders.
  5. Structural support systems that are not to be left in place may be removed only when the excavation has been backfilled to such an elevation so as to prevent the collapse of the sides of the excavation. Any voids created by the removal of the structural support system members, must be filled and compacted in an acceptable manner.

### 3.3 EXCAVATION

#### A. Trench Excavation (Open Cut)

1. The width of the trenches must provide adequate space for workers to place and join the pipe properly, and must be kept to the minimum practical width. Unless otherwise approved by the Commissioner, the total clear width of the trench at the level of the top of the pipe and at grade must be at the Neat Lines as detailed on the Drawings.
2. The Contractor must excavate a minimum of 6-inches below the bottom of the pipe unless otherwise shown, specified, or directed, so bedding material can be placed in the bottom of the trench and shaped to provide a continuous

firm bearing for the pipe barrel. Bell holes must be provided for proper make-up of the joints.

3. The open excavated trench preceding the pipe laying operation and the unfilled trench with pipe in place must be kept to a minimum length causing the least disturbance. The maximum length of open trench must not exceed 300-feet unless otherwise directed by the Commissioner. Comply with Article 4G, CDOT Specifications, for other trench opening length requirements within the public right-of-way.
4. Excavation In Arterial Streets. Comply with Article 4C, CDOT Specifications, for protection requirements when working within arterial streets.
5. Contractor must saw cut existing pavement prior to excavating. Width of saw cut pavement must be such that any sheeting provided for excavation protection is not in contact with the pavement.
6. Where water is encountered in the excavation, the excavation must be dewatered in accordance with Section 31 23 19 – Dewatering Excavation of these specifications.
7. Wherever the nature of the ground will permit, the bottom of the excavation for monolithic and brick sewers must have the shape and dimensions of their outside invert and for pipe sewers the shape and dimensions of the outside of their lower quarter. If the bottom of the trench cannot be shaped to the required form and maintained until a section of the sewer is safely constructed, then the bottom and sides of the trench must be made to conform as nearly as possible to the external shape and dimensions of the sewer, and the space between the outer surface of the sewer and the bottom and sides of the trench must be filled with suitable material for stabilization of the trench bottom.

B. Rock Excavation (open cut)

1. Whenever rock, stone, masonry or other hard, unyielding material is encountered at or above the required trench bottom elevation, remove it to provide a clearance of no less than 6-inches below and on each side of pipes and associated fittings, valves and other appurtenances. Backfill the over excavated area with granular bedding material.
2. Removal of Rock by blasting or by use of a drop hammer is not permitted under this contract.
3. Excavate rock as near as practicable to the outside shape of the work as shown on the Plans. Solid rock, not loosened from the adjacent solid rock, may extend within the neat outside surfaces of these shapes no more than two (2) inches, provided no single projection exceeds one and one-half (1.5) square feet in area at the neat surfaces of the excavation and provided that on any ten (10) foot section of the excavation the total area of such projection at the neat outside surfaces of the section does not exceed twenty (20) percent of the area of the section.

4. The Contractor is required to remove all loose rock and other material from the excavation and in the event that the excavation is enlarged beyond the outside shape of the sewer or sewer structures as shown on the Plans, the Contractor will not be entitled to any payment for the additional Class SI concrete needed to fill the voids caused by such over-breakage.
5. Where rock is encountered, excavate to eight (8) inches below the bottom of the pipe for bedding placement.

C. Trench Excavation (Short Tunnel Construction)

1. In some instances, trees, fire hydrants, sidewalks, and other obstructions may be encountered, the proximity of which may be a hindrance to open cut excavation. In such cases, the Contractor must excavate by means of short tunnels in order to protect such obstructions against damage. Short tunnel work will be considered incidental to the construction and no additional payment will be allowed.

D. Additional Trench Excavation

1. If the soils encountered at the elevations specified are not suitable, or it is determined necessary to go to an additional width and depth, or required to fill designated areas for work done under Section 02 60 00 - Special Soils Excavation and Disposal, the excavation must be carried to such additional width and/or depth and must fill such excavated areas with approved backfill material as required or directed by the Commissioner.

E. Unauthorized Excavation

1. Wherever the excavation is carried beyond or below the lines and grades shown on the Drawings all such excavated space must be refilled with select fill materials and in such manner as may be directed in order to insure the stability of all affected structures. Beneath all structures, space excavated without authority must be refilled by the Contractor with approved backfill materials and will be considered incidental to the construction and no additional payment will be allowed.

F. Trenching Across or Over Existing Excavations or Utility Trenches

1. In the event that the trench passes over or through a previous excavation, carefully compact and stabilize the bottom of the new trench or excavation to a density equal to or greater than 95% of the maximum dry density as determined by ASTM D1557. Perform this compaction carefully to avoid damaging the existing utility or structure.

G. Special Excavation

1. Remove unsuitable materials to provide two (2) feet minimum horizontal and vertical clearance around water mains or related structures as applicable, unless otherwise directed by the Commissioner.

H. Excavation in Tunnel

1. The tunnel must be excavated and trimmed to such size and shape as will allow the placing of the full section of the pipe as shown on the Plans after all lining is in place.
2. The Contractor must excavate the tunnel and support the surrounding earth so there is no movement of the earth over or adjacent to the work at any time. The Contractor must excavate the tunnel and support the surrounding earth so at no time there is more than 5 feet, measured horizontally, unsupported by bracing as approved by the Commissioner.
3. The Contractor must use extreme care in excavating and trimming to insure that a full section will be placed without materially deviating from the correct lines and grades of the finished structure.
4. In case, due to bad soil conditions, the Contractor requests that the outside outline of the sewer be changed to a minor extent to accommodate his method of construction, such a change will be allowed provided the strength of the structure is not impaired. Any such modification will not alter the price per foot specified to be paid for the completed sewer, whether such minor modification results in a minor addition or subtraction from the theoretical quantity for the section herein specified.
5. If permission is given the Contractor to excavate the tunnel for a specified distance without immediately placing the concrete lining, the proposed method of bracing the tunnel and the extra bracing necessary must be submitted for approval.
6. No additional payment or allowance of any nature will be made for timber cants, steel plates or other forms of tunnel lining used for supporting the earth during construction. All such tunnel lining must be left in place.

3.4 PLACEMENT OF PIPE BEDDING

A. Pipe Bedding

1. Pipe laid in trenches must be bedded in accordance with the details shown on the Drawings. Bedding material must consist of compacted; well-graded crushed stone fill material as shown and as specified, or as directed by the Commissioner.
2. Existing underground structures, tunnels, conduits, and pipes crossing the excavation must be bedded with compacted sand. Bedding material must



be placed under and around each existing underground structure, tunnel, conduit, or pipe as required to stabilize the excavation.

3. At each joint, enough depth and width must be provided around the pipe so that joints can be properly made up.

B. Bedding Placement – Vaults and Structures

1. Pipe bedding beneath precast bases, cast-in-place bases and other foundations must be 6-Inches in thickness and thoroughly compacted in place to not less than 95% of the maximum dry density as determined by ASTM D1557.

C. Bedding and Backfill for Short Tunnel

1. Pipes placed in short tunnels must be bedded in sand. The annular space between the pipe and undisturbed earth must be completely filled with compacted sand fill material. Pipelines in short tunnels must be supported to permit the placement of backfill.

### 3.5 BACKFILLING EXCAVATIONS

A. General

1. All excavations must be backfilled to the original surface of the ground or to such other grades shown on the Drawings or as directed by the Commissioner. For areas to be covered by topsoil, backfill must be left 6-inches below the finished grade or as shown on the Drawings, or directed by the Commissioner. All backfilling must be done as soon as possible after water main piping has been installed and inspected, and as soon as mortar for masonry or thrust blocks have sufficiently set, unless directed otherwise by the Commissioner.
2. Crushed stone fill material must be used for trench and structure backfill and other areas as shown, specified, or ordered by the Commissioner.
3. Unsuitable material and material rejected by the Commissioner must immediately be removed from the Site and disposed of by the Contractor at his expense.
4. Construction equipment used to backfill against and over cast-in-place concrete structures must not be permitted to travel over these structures until the designated concrete strength has been obtained, as verified by concrete test cylinders. In special cases where conditions warrant, as determined by the Commissioner, the above restriction may be modified if the concrete has gained sufficient strength, as determined from test cylinders, to satisfy design requirements for the removal of forms and the application of load.

B. Backfill Procedure

1. Crushed stone fill material must be used for backfill where roadways, driveways, sidewalks or other pavements are to be placed on the backfill or where the edge of the trench excavation is 5 feet or less from any county or state highway, any city or village street pavement and in any trenches crossing

pavements or sidewalks from a distance beyond the edge of the pavement or sidewalk equal to the depth of the trench. Crushed stone fill material must be used as backfill in trenches parallel to roadways, driveways or other pavements from the top of the bedding to a depth below the ground surface equal to the distance between the inner face of the trench and the closest edge of the pavement.

2. Where pavements and appurtenances for streets are to be placed over the trenches, the backfill material must be placed in uniform layers not greater than 6-inches in thickness and compacted in place. Each layer must be compacted to or not less than 95% of the maximum dry density as determined by ASTM D1557.
  3. All pipe sewers must be surrounded and covered by trench backfill above the granular embedment as soon as they are laid. The trench backfill must be properly compacted and tamped to a depth of at least one foot above the top of the pipe prior to placing the remainder of backfilling.
  4. For sewer pipe construction with FA 6 backfill, water jet the backfill to the depth of approximately two-thirds of the depth of cover over the sewer. The distance between jetting holes must not exceed 10 foot along the length and width of the trench, or as directed by the Commissioner. Water jetting of the trench backfill must proceed as soon as practicably, as determined by the Commissioner. The Contractor, in this manner, must place and compact the trench backfill to the level of the sub-grade.
  5. Excavated material can be re-used as backfill only if directed or approved by the Commissioner.
  6. Where railroad tracks or pavements for highways are to be placed over trenches, the backfill must be placed in conformance with the standards set forth by the respective agency having jurisdiction over the railroad or highway.
  7. Trench backfilling work must be done in such a way so as to prevent damage to any pipe, utility, or structure.
  8. On monolithic concrete sewers and structures cast-in-place, trench backfill must not be placed until the concrete has attained a compressive strength of 2,000 psi.
- C. Backfill under a Supported Water Main
1. Backfill the open trench under the water main and 10 feet beyond the water main sides with approved material up to a level of 1-foot below the invert of the supported water main. The backfill material must be placed in layers of 12-Inches with each layer mechanically compacted to 95% of the maximum dry density as determined by ASTM D1557.
  2. Place pipe bedding material from 1-foot below the water main invert to the water main centerline and compact to achieve 95% of the maximum dry density as determined by ASTM D1557.

3. Remove the water main pipe support systems, supporting beams, and pipe support straps; and cut-off and remove soldier piles to a level at least four (4) feet below finished grade.
4. The water main pipe must be inspected for leakage and joint integrity and repaired if necessary, prior to backfilling above the water main.
5. After approval by the Engineer, continue backfilling with approved material. The open trench must be backfilled up to the required sub grade level. The backfill material must be placed in layers of 12-Inches with each layer mechanically compacted to 95% of the maximum dry density as determined by ASTM D1557.

D. Backfilling with Controlled Low Strength Material (CLSM) - Flowable Fill

1. Do not place the mix on frozen ground, in standing water, or during wet weather conditions. Mixing and placing may begin only if the air temperature is 35° Fahrenheit minimum and rising. At time of placement, the material temperature must be 40° Fahrenheit minimum. Mixing and placing must stop when the air temperature is 40° Fahrenheit and falling.
2. Place the mix directly from the chute into the space to be filled. Other placement methods may be approved by the Commissioner if the mix design is appropriate.
3. When backfilling against structures, place the mix in layers to prevent damage by lateral pressures. Side slopes must be stepped or serrated to prevent wedging action of the backfill against the structure. Allow each layer to harden prior to placing the next layer.
4. When backfilling pipe trench, distribute the mix evenly on each side of the pipeline to prevent movement.
5. The mix must not be exposed to freezing temperatures or wet weather conditions during the first twenty (24) hours after placement.
6. The mix may be subjected to loading upon approval by the Commissioner, or when a penetration of 39 mm / blow or less has been obtained with the Dynamic Cone Penetrometer test.
7. Backfilling against water main pipe with CLSM is not allowed, unless authorized otherwise by the Commissioner. Contractor must provide a minimum of 6-inches of coarse aggregate backfill material over the water main pipe prior to placing the CLSM material.

3.6 FINISH GRADING

- A. Finish grading must be performed in accordance with the completed contour elevations and grades shown and must be made to conform to the existing ground surface. All finished graded surfaces must be left smooth and firm and graded to permit positive drainage.

3.7 TRAFFIC CONTROL

- A. The Contractor is responsible for traffic control and the protection of vehicular and pedestrian traffic from the work. For detailed requirements see Section 01 55 26.

END OF SECTION 31 23 10

## **SECTION 31 23 19**

### **DEWATERING EXCAVATIONS**

#### **PART 1 - GENERAL**

##### **1.1 DESCRIPTION OF WORK**

- A. This section includes requirements for dewatering excavations when necessary to provide a safe working environment and protect the Work so as to provide a satisfactory installation.

##### **1.2 WORK OF THIS SECTION SPECIFIED ELSEWHERE**

- A. Section 01 11 00 – Summary of Work.

##### **1.3 SUBMITTALS**

- A. Refer to Book I for submittal requirements and procedures for Shop Drawings, Product Data, Records and Samples.
- B. Prior to commencing excavation work at the project site, the Contractor must submit to the Commissioner for review and comment a method for removing water which has entered the excavation either from groundwater sources, surface drainage, or other source such as the dewatering of a new or existing water or sewer main. The submittal must include a description of the source of the water, equipment to be used to dewater the excavation, the arrangement and discharge rate of the equipment expressed in gallons per minute. No excavation is to be started until authorization has been given by the Commissioner to proceed with the excavation work.
- C. When applicable for sewer projects, the Contractor is to submit the proposed method for by-pass pumping and fluming of sewage to the Commissioner for review and comment.

#### **PART 2 - PRODUCTS (NOT APPLICABLE)**

#### **PART 3 - EXECUTION 3.1**

##### **PREPARATION**

- A. Capacity of Facilities
  - 1. Facilities for the removal and disposal of water must be of sufficient capacity to keep the excavation dry under all circumstances.

B. Standby Facilities

1. Adequate standby facilities must be provided to insure that the excavation will be kept dry in the event of power failure or mechanical breakdown.

C. Well Points

1. If well points are used, the Contractor must make provisions for removing and resetting individual well points without taking any part of the dewatering system out of service.

### 3.2 CONSTRUCTION

A. Dewatering

1. At all times during the excavation period and until completion of the Work and acceptance at final inspection, ample means and equipment must be provided with which to promptly remove and properly dispose of all water entering any excavation including leakage from the existing water main which is to be replaced. All excavations associated with the Work must be kept dry. Water must not be allowed to rise over, or to come in contact with, masonry and concrete until the concrete and mortar has attained a set satisfactory to the Commissioner and, in any event, no sooner than twelve (12) hours after placing the masonry or concrete.

B. Groundwater Levels

1. The Contractor must maintain the groundwater level at least 12-Inches below the bottom of the excavation until the excavation until the Work has been completely and the excavation has been backfilled.

C. Water Management

1. Water pumped or drained from the Work must be disposed of in a suitable manner without damage to adjacent property, other Work under construction, street pavement, and parks. Water must not be discharged onto streets without adequate protection at the point of discharge. No water containing settleable solids may be discharged into sewers.
2. All damages caused by dewatering the Work must be the responsibility of the Contractor and must be promptly repaired at the Contractor's expense.
3. Limit dewatering flow rates to current operating capacity of City sewers. See Section 01 11 00 for any limitations on discharge rates.

D. Pumping, Bailing and Diversion

1. The Contractor must at all times during construction provide and maintain ample means and devices for the temporary diversion of flow in existing sewers and drains and the prompt removal and proper disposal of all water or sewage entering the tunnels, trenches or other parts of the work, and must keep said excavations as dry as practicable until the structures to be built therein is completed. All water pumped or drained from the work and from existing sewers must be disposed of in a suitable manner without damage to adjacent property, or to sewers, pavements, electrical conduits or other work or property. The Contractor must provide all temporary flumes or pipe lines and pumping equipment required for the proper diversion of sewage and removal of drainage from the work.
2. Whenever the Contractor removes an existing bulkhead, he must install a screen suitable for the purpose of preventing construction debris from floating into the completed portions of the sewer system. As work progresses, Contractor must clean the completed portions of the sewer by removing rails, jacks, lumber, sandbags and all other construction equipment, excess material and debris.
3. The Contractor must place and maintain all temporary dams, flumes, bulkheads or other structures necessary to prevent water from adjacent sections of the sewer system from entering the work under this Contract in such a manner as to injure it, and must completely remove all such temporary structures from the completed portion of the work as rapidly as practicable. The Contractor must not place a dam, flume or bulkhead in any sewer without first obtaining the approval of the Commissioner. The Contractor must ascertain the possibility of sewage backing up into basements and causing damage and he will be held responsible for any such damage.
4. The City does not assume responsibility for providing the Contractor with an outlet for any storm water or sewage which must be disposed of during the construction work under this Contract. Until the acceptance of the work, the Contractor will, if so ordered by the Commissioner, keep the entire work pumped free of water and sewage and before the acceptance of any part of the work. Contractor must clean the entire length of such finished part of the work to the satisfaction of the Commissioner.
5. Water must not be allowed to flow over or stand on the pipe or structure invert in such a manner as to cause scouring of the surface.

6. Route all water pumped from trenches or other excavations to settling basins (five feet by ten feet by two feet deep with three compartments) before entering the City of Chicago sewer system. Discharge from the settling basin must be by gravity to the catch basin.

END OF SECTION 31 23 19



## **SECTION 33 01 30**

### **CLEANING AND LINING SEWER MAINS**

#### **PART - 1 – GENERAL**

##### **1.1 DESCRIPTION OF WORK**

- A. This section includes the requirement for cleaning and cured-in-place lining of existing sewer main, lateral piping and tee connections, and by-pass pumping operations necessary to perform lining of existing sewers.
- B. WORK OF THIS SECTION SPECIFIED ELSEWHERE:
  - 1. City of Chicago Department of Water Management – 2006 Sewer Permit Requirements and Fees
  - 2. Book 3 - Technical Specifications
    - a. Section 01 55 26 – Maintenance of Traffic.
    - b. Section 01 32 36 – Televised Inspection of Sewer Mains.
    - c. Section 33 39 13 – Sewer Manholes, Catch Basins, Frames and Covers.
    - d. Section 31 23 10 – Excavation, Trenching and Backfilling.

##### **1.2 REFERENCES**

- A. American Society for Testing and Materials (ASTM), latest edition:
  - 1. ASTM D638: Standard Test Method for Tensile Properties of Plastics.
  - 2. ASTM D790: Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
  - 3. ASTM D2990: Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics.
  - 4. ASTM D5813: Cured-In-Place Thermosetting Resin Sewer Pipe.
  - 5. ASTM F1216: Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.

##### **1.3 SUBMITTALS**

- A. Submit the following information to the Commissioner for review in accordance with Book 1 - Shop Drawings, Product Data, Records and Samples.
- B. Product Data:
  - 1. Detailed information regarding materials, chemical charts, and catalog data on all materials proposed for lining sewer mains and laterals at least 28 days before it is to be used for lining the pipeline.

C. Detail Information:

1. Design calculations of proposed sewer lining for each installation.
2. Wet out procedures for liner prior to installation.
3. Equipment, methods, flushing, reinstatement of services, and testing, and operations schedules proposed for cleaning and lining work.
4. Locations for the access openings for cleaning and lining prior to construction and after having reviewed these locations in the field.

D. Samples:

Contractor is responsible at his own expense for taking, and shipping of all samples of materials used for lining. For each inversion (or insertion), two cured-in-place samples must be taken from a section of the cured pipe at an intermediate manhole or from a coupon cut from a lateral connection. Samples must be clearly identified with the date, time and location of the inversion (or insertion). The samples must be turned over to the onsite Engineer immediately after removal.

1. One sample will be retained by the Department; the other sample must be tested in accordance with current ASTM specifications for cured-in-place pipe. Testing must be performed by the Contractor through a certified independent testing laboratory.
2. Test results must be submitted to the Department no later than 30 days after sampling and will be certified and stamped by a licensed Professional Engineer registered in the State of Illinois. **The Department will reject all inversions (or insertions) not meeting the ASTM specifications.**

1.4 QUALITY ASSURANCE

- A. Perform all work under the constant supervision of a qualified foreman with at least three years of experience within the last five years in this type of work. Submit a record of experience of proposed foreman to the Commissioner in accordance with Book 1 - Shop Drawings, Product Data, Records and Samples prior to the start of work. The record is to include location and description of work, supervisor's and company's name, and dates the experience took place.
- B. Provide minimum interference with the operation and maintenance of all interconnected sewer systems.
- C. Televised Inspection:

1. Contractor must televise and record the interior of all pipelines to be rehabilitated in accordance with Section 01 32 36, Televised Inspection of Sewer Mains at the following times:
  - a. Following cleaning of pipeline: In the presence of the Commissioner's representative inspect for satisfactory cleaning, defects in pipeline and service lateral locations and condition and report findings to the Commissioner. The Commissioner is to determine whether repair or replacement is required.
  - b. If the installation of tee-liner for lateral sewer connections or lateral sewer point repair is required by the Commissioner. Contractor must inspect for satisfactory installation of repair.
  - c. Following applications of cured-in-place lining Contractor must again televise the interior of the sewer to inspect for satisfactory application of cured-in-place lining and restoration of laterals.
2. Provide two labeled copies of all televised inspections in DVD format to the Commissioner within five (5) days of taping.

D. Cured-In-Place Lining:

1. The Commissioner's inspection and acceptance of cleaning is required before cured-in-place lining of the pipeline sections.
2. All lining thicknesses and tolerances must be in accordance with the latest revision of ASTM F1216 and the approved design calculations.
3. The Commissioner's approval is required for acceptance, after cured-in-place lining work is completed for the pipeline sections.

1.5 DELIVERY, STORAGE AND HANDLING:

- A. All excavated materials and equipment to be incorporated in the work must be placed so as not to injure any part of the work or existing facilities and so that free access can be had at all times to all parts of the work and to all public utility installations in the vicinity of the work. Excavated material is not to be stockpiled on the work site overnight. Materials and equipment must be kept neatly piled and compactly stored in such locations to avoid inconvenience to public travel and adjoining owners, tenants and occupants.

1.6 PROJECT / SITE CONDITIONS:

A. Environmental Requirements:

1. Do not perform work during unsuitable weather conditions including cold weather temperatures below 40<sup>0</sup> Fahrenheit that may affect the lining process.
2. The Contractor must clarify discharge water from the cleaning process by separating the solid deposits removed from the sewer main. The clarified water is to be disposed of into existing sanitary or combined sewer manholes adjacent to the access point at the discharge location. The roadway and adjacent areas should be kept free of standing water at all times. The Contractor is to submit a diagram of the proposed method of clarifying the water and associated discharge system to the Commissioner for review and approval.
3. Solid deposits removed from the interior of the main are to be collected and disposed of in a legal manner by the Contractor.

B. Existing Conditions:

1. Existing pavement and base pavements may be cut no larger than necessary to provide working space for access pits and installation of appurtenances. Pavement removal is to be in accordance with Section 31 23 10 – Excavation, Trenching and Backfilling.
2. All field measurements will be the responsibility of the Contractor.
3. Traffic control is to be in accordance with Section 01 55 26 – Traffic Control and Regulations – the maximum to be closed is one lane.

## 1.7 SEQUENCING AND SCHEDULING

- A. All sequencing and scheduling of the work will be the responsibility of the Contractor. The Contractor will be required to submit a detailed schedule and work sequence plan to the Commissioner for review in accordance with Book 1 - Shop Drawings, Product Data, Records and Samples prior to beginning any work. The review of this schedule and sequencing plan are for record purposes only and does not constitute acceptance of any means or methods of Construction by the Contractor.

## 1.8 WARRANTY

- A. The Contractor must warrant the work in its entirety for a period of five (5) years. The warranty period must begin at final completion of the project.

## PART - 2 PRODUCTS

## 2.1 MATERIALS

- A. General Description: A liner to be installed in an existing sewer using resin-impregnated flexible felt tubes. The liner is to be inverted into the existing sewer utilizing a vertical inversion standpipe and hydrostatic head. Curing is to be accomplished by circulating hot water or any other approved methods suitable to cure the resin into a hard impermeable pipe (sewer liner). When cured, the liner is to extend over the length of the inversion as a continuous tight fitting watertight pipe-within-a-pipe.
- B. General Corrosion Requirements: The finished liner must be fabricated from materials which are chemically resistant to withstand exposure to domestic sewage when cured.
- C. Materials: The liner tube must be fabricated to a size that when installed will neatly fit the internal circumference of the sewer specified by the City. Allowance must be made for circumferential stretching during insertion. Unless otherwise specified, the Contractor must furnish a general purpose unsaturated polyester resin or epoxy vinyl ester resin or an equally compatible resin meeting the requirements of this section. The catalyst system must be compatible with the process being utilized and it must provide the cured physical strengths specified herein.

Physical Strength: The cured sewer liner must conform to the minimum structural standards, as listed below:

Cured Sewer Liner	Standard	Results
Test Method for Tensile Properties of Plastics	ASTM D-638	2,500 psi
Test Method for Flexural Properties of Plastics (Flexural Strength)	ASTM D-790	4,500 psi
Test Method for Flexural Properties of Plastics (Flexural Modules of Elasticity)	ASTM D-790	250,000 psi

- D. Liner Thickness: The liner for the rehabilitated sewer must be designed in accordance with ASTM F1216 using the following parameters.
1. The sewer to be rehabilitated will be considered fully deteriorated.
  2. The rehabilitated sewer will be subject to an earth load of 120 pounds per cubic foot.
  3. Applicable live load conditions will be considered using A.A.S.H.T.O. HS-20 highway loads.

4. A value of two (2) will be used for the Factor of Safety.
  5. The factor for the ovality of the existing sewer is to be determined using the videotape or videodisc of the televised sewer provided by the Department.  
  
For bid purposes assume the average out of roundness of pipe to be lined is 5%.
  6. When the crown of the sewer to be rehabilitated is 7 feet or less below the surface grade, the soil modulus value will be 700 psi. When the crown of the sewer to be rehabilitated is more than 7 feet below the surface grade, the soil modulus value will be 1,000 psi. For bid purposes assume the average cover over the pipe to be lined is between five (5) feet and eight (8) feet
  7. The maximum creep retention factor will be 50%.
  8. Ground water depth 10 foot below the surface grade.
- E. Lateral and Tee Liner. The liner materials must provide the flexibility to line 45 to 90 degrees bends and produce a smooth inside radius.

## 2.2 EQUIPMENT

### A. Cleaning

1. Sewer mains must be cleaned using a combination of flushing and one or more of the following cable-attached devices, including bucket machines, hydraulic-jet cleaning, rodding machines, and vacuum machines. Other types of cleaning may be utilized by the Contractor if they are capable of producing the specified results and are approved by the Commissioner.
2. The cleaning equipment must be capable of removing all dirt, grease, rocks, bricks, tree roots, mineral deposits, and other deleterious materials and obstructions from the main sewers and manholes.
3. The type of equipment and the method to be used must be based on the condition of the sewer, lateral sewer, or connection to the existing sewer at the time work commences without causing damage to the piping. The selection of equipment must produce the results specified and will be at the Contractor's discretion, subject to the approval of the Commissioner.

### B. Bypass Piping

1. The Contractor will be required to supply continuous service to both commercial and residential customers at all times during both the cleaning and lining process when called for on the drawings, specified, or when directed by the Commissioner. All cleaning methods, even those requiring short shutdowns will be required to have a bypass piping system in place.

There will be no additional compensation to the Contractor for protecting any bypass piping system from weather, accident or vandalism.

## 2.3 SOURCE QUALITY CONTROL

- A. All materials provided and work performed will be subject to inspection. The Contractor must provide, without additional cost to the DWM, samples and reasonable assistance for the inspection of materials and workmanship. The minimum amount of inspection or verification required will be as outlined in ASTM F1215.

## PART - 3 – EXECUTION

### 3.1 EXAMINATION AND INSPECTION

- A. The entire procedure for cleaning the pipeline and the application of the cured-in-place lining will be subject to continuous inspection by the Commissioner, but the inspection does not relieve the Contractor of the responsibility to provide material and perform work in accordance with this specification. The guarantee period must be five (5) years from the date of final completion. Any repair of defective lining will be at the discretion of the Commissioner and the cost to make such repairs is to be borne by the Contractor.

### 3.2 PREPARATION

- A. Cleaning
  - 1. The Contractor must clean all sewers, lateral and tee connections as required for liner installation. For sewer cleaning, all sludge, dirt, sand, rock, grease, and other solid or semi-solid material existing or resulting from the cleaning operation must be removed at the downstream manhole of the main sewer section being cleaned. The Contractor must not pass material from one main sewer section to another main sewer section.
  - 2. For sewer cleaning, whenever hydraulic cleaning equipment is used, a suitable weir or dam must be constructed in the downstream manhole of the main sewer section from which material is being removed that traps all solids for removal from the sewer.

Whenever a bucket machine is used, a suitable container must be provided to receive the materials dumped from the bucket machine.

- 3. In the event of a rain storm causing debris to wash into a previously cleaned main sewer section/lateral connection, the Contractor must ensure that such main sewer sections/lateral connections are cleaned again prior to the installation of the liner.

The Contractor is responsible at the final inspection for ensuring that the entire job is acceptable to the Commissioner.

4. The Department retains the right to determine the acceptance or rejection of all work according to the terms of these Special Provisions. In the event of a rejection of the completed work, corrective action must be initiated within 48 hours of a notice of rejection.

B. ROOT REMOVAL

1. Roots must be removed during the cleaning operation prior to the installation of the liner in those main sewer sections and lateral connections where root intrusion is a problem. All Contractor costs for root removal will be considered incidental to the appropriate bid items for cleaning and no separate payment will be made.

C. CUTTING OF PROTRUDING LATERAL SEWER CONNECTIONS

1. The Contractor must cut and remove protruding private drain lateral connections as ordered by the Commissioner. The work must be accomplished without open excavation by use of cutters inserted into the sewer and operated from a remote surface location.

D. DISPOSAL OF MATERIALS REMOVED

1. All solids or semi-solids resulting from the cleaning and/or repair operations must be removed from the site by the Contractor on a daily basis and transported for disposal in an approved dump location conforming to all current government regulations.
2. The Contractor must not deposit or accumulate debris in main sewer sections.
3. No debris or dump boxes will remain on the public way outside of working hours unless a prior written request is submitted and approved in writing by the Commissioner.

E. PROTECTION DURING CLEANING OPERATIONS

1. Satisfactory precautions must be taken to protect the main sewers and sewer manholes from damage that might be caused by the improper use of cleaning equipment. Whenever hydraulically propelled cleaning tools, which depend on water pressure, or any tools which retards the flow of water in the main sewers is used, precautions must be taken to ensure that the water pressure created does not cause any damage or flooding to any public or private property served by the main sewer section being cleaned.
2. The flow of waste water in the main sewers will be utilized to operate hydraulic cleaning devices whenever possible. When it is necessary to use additional water from other sources to avoid delay in normal work procedures, the water will be conserved and not used unnecessarily. Fire hydrants must not be obstructed by the Contractor's operation.



3. The Contractor is responsible for the costs of restoring all damage to public and private property as a result of all cleaning operations.

#### F. PROTECTION DURING REHABILITATION OPERATIONS

1. Satisfactory precautions must be taken to protect the main sewers, sewer manholes and lateral connections from damage that might be inflicted by the improper use of rehabilitation equipment. The Contractor must use care to prevent damage to portions of the sewers, sewer structures and lateral connection which are to remain in place. All repairs outside of the limits of removal or order by the Commissioner and which are damaged by the Contractor will be repaired or replaced by the Contractor without cost to the City.
2. The Contractor will be responsible for all damage to public and private property as well as all repairs outside of the limits of removal or as ordered by the Commissioner which are damaged by the Contractor must be repaired by the Contractor without cost to City.
3. The Contractor must take all necessary precautions to insure that the water pressure created by diverting or retarding the flow does not cause any damage or flooding to public or private property being served by the main sewer section being rehabilitated.
4. The Contractor's attention is called to the fact that flows in the existing sewers could flood the work under this Contract, especially in the event of heavy rains. He must be prepared at all times to safeguard workmen and protect the work under this Contract from damage by flooding. The Contractor will maintain the flow of the existing sewers.
5. The Contractor must install a screen capable of keeping debris from entering the sewer system.

### 3.3 INSTALLATION

#### A. Sewer Flow Control

1. Pumping and By-passing: When pumping and bypassing is required, the Contractor must supply the pumps, flumes, and other equipment necessary to divert the flow of waste water around the main sewer section being rehabilitated. The contractor must submit in writing to the Commissioner for approval, a plan for pumping and bypassing. The bypass system must have the necessary capacity to handle existing flow plus additional flow that may occur during a rainstorm. The Contractor will furnish the necessary labor and supervision to set up and operate the pumping and bypass system.
2. While performing the work under this Contract, the Contractor will comply with all applicable Federal, State and Local statutes, ordinances, and directives with respect to the elimination of excessive noise and pollution of air and water due to

his operations. When pumping and by-passing is required, engines will be equipped in a manner to keep noise to a minimum.

3. Flow Control Precautions: When a main sewer is plugged, blocked, or bypassed, sufficient precautions must be taken to protect the main sewer from damage that might result from sewer surcharging. Precautions must be taken to ensure that the sewer flow control operations do not cause flooding or damage to public or private property served by the sewer being rehabilitated.

B. Pumping Discharge from Private Drains

1. This work must be performed as specified herein by a drain-layer licensed by the Department.
2. This work is required when a private drain cannot be placed out of service during the period of sewer rehabilitation work. The Contractor, in such cases, must intercept the discharge from a private drain, provide a temporary by-pass manhole, and pump the flow to a nearby active sewer.
3. The work includes pavement removal, excavation, disposing of all material, earth retention system, pumping, fluming, removing water and sewerage, furnishing all materials required to connect all existing live drains to the sewer; furnishing, placing and water jetting of trench backfill material; the bypass system for the private drains will include the temporary sump, pumping unit and discharge line to an active sewer; restoring the private drain and backfilling as specified; furnishing and placing surface restoration to the original condition or better; furnishing all materials required and all incidental work.
4. The sump pump is to be installed in a pit within the street's right-of-way, as approved by the Commissioner. After the sewer rehabilitation work is completed, the private drain by-pass including a sump, pumps, temporary discharge line, etc. must be removed. The broken drain must be replaced using short lengths of full pipe, with compression joints meeting the requirements of these Specifications. When it is not feasible to repair the drain with full lengths of pipe, a sewer repair coupling with adjustable stainless steel shear rings may be used with Commissioner's approval. Following the completion of this work the drain must be rodded and checked for proper function.
5. The sump for the private drain by-pass system must be of such size and material that no flow is permitted to infiltrate into the adjacent soil. The pump must be of adequate capacity as to handle the maximum possible flow from the drain.
6. The Contractor is to maintain an adequate and properly functioning drain by-pass system. The pumping must continue until the disconnected drain is reconnected to the sewer permitting gravity flow. The Contractor is responsible for all property damage that is due to waste water backup from disconnected drains and damages will be recoverable from him.
7. The replacement drain pipes must be of the same material as the existing drain pipes unless otherwise approved by the Commissioner. Full length replacement

drain pipes must be installed in a manner that the face of the spigot is brought into contact with the shoulder of the socket. When this is not feasible, the Commissioner may permit removal of half the circumference of the bell for ease in pipe installation. In this latter case, the pipe must be rotated by 180 degrees along the horizontal axis to bring the intact portion of the bell to the bottom of the pipe. The joints must be covered with a collar of brick and mortar, with the bricks laid perpendicular to the joint or a concrete collar formed around the connection of a structural grade concrete or grout with a minimum 28 day compressive strength of 3,000 psi.

8. The maximum width of a trench is the outside diameter of sewer plus 8 feet.
9. When water mains cross the existing drain within the limits of excavation the Contractor must support, protect and use special care in the area of the water mains. All cost incurred by reason of such work must be included in the prices bid for the appropriate items.
10. The Contractor must recognize the fact that it is impractical for utilities to relocate their lines that cross, run parallel or are within the limits of the sewer trench. Hand excavating and supporting of any and all utilities within the limits of the sewer trench will be performed by the Contractor in cooperation with the utility owners, unless advised otherwise by the Commissioner. The Contractor must provide adequate protection in conformance with the standards set forth by OSHA regulations. The Contractor must take all reasonable precautions necessary to insure the safety of its workers and the protection of the utilities encountered.
11. When the use of a trench box is approved and conditions do not permit its use due utility interference, the Contractor, must furnish, place and maintain all sheeting, bracing and shoring required to properly maintain the trench
12. Prior to starting work, the Contractor must submit the details of all by-pass systems to the Commissioner for approval.

C. Cured-In-Place Lining:

1. Proceed as soon as possible after pipeline is cleaned, necessary point repairs completed and the Commissioner has approved, in writing, the pipeline to be lined.
2. Conform to ASTM F1215.
3. The Contractor is to designate the location where the felt tube liner will be vacuum impregnated, wet-out, prior to installation.
4. Transport impregnated liner at a temperature below 40 degrees Centigrade and out of direct sunlight and install within 24-hours of wetting.
5. Insertion of prepared impregnated felt tube for:
  - a. The liner for laterals must be inverted into the existing lateral sewer connection utilizing a launching, carrying and bladder devices launched in

- the main sewer that will effectively invert the tee-liner into the lateral sewer connection.
- b. The liner for sewers must be inserted through an existing manhole or other suitable point of access by an inversion, inside-out, process using hydrostatic head to fully extend the felt tube to the next manhole or access point. The addition of a manhole or the modification of an existing manhole must be as defined in Section 33 39 13. Sewer Manholes, Catch Basins, Frames and Covers.
6. The cured-in-place liner must cure the inverted impregnated felt tube with a suitable heat source and water re-circulating equipment to a temperature deemed adequate by the Contractor to cure the impregnated felt tube. The water used to cure the impregnated felt tube must be cooled and the static head released in such a manner as to avoid damage to the cured liner.
    - a. Gauges are to be provided to monitor ingoing and outgoing temperatures of the curing water supply and at the downstream manhole location.
    - b. Temperature, in accordance with the resin manufacturer, is to be maintained until the temperature to achieve an exotherm is reached for the duration recommended and the exposed sections of liner in the up and downstream appear sound and hard.
    - c. Pressure is to be maintained until the temperature of the hardened pipe is below 100 degrees Centigrade.
  7. The cured resin-impregnated tube must be and be free from visual defects and:
    - a. Continuous between manholes over each section of the sewer main liner.
    - b. Extend over the length of the inversion as a continuous tight fitting watertight pipe-within-a-pipe for lateral liner.
    - c. When cured, the tee-liner should extend between the service lateral connection and overlaps the main sewer as a continuous tight fitting watertight pipe-within-a-pipe.
- D. Pumping, Bailing and Diversion
1. The Contractor must provide and maintain at all times ample means and devices for the temporary diversion of flow in existing sewers and drains and the prompt removal and proper disposal of all water or sewage entering the tunnels, trenches or other parts of the work, and must keep said excavations as dry as practicable until the structures to be built have been completed. All water pumped or drained from the work and from existing sewers must be disposed of in a suitable manner without damage to adjacent property, or to sewers, pavements, electrical conduits or other work or property. The Contractor must provide all temporary flumes or pipe lines and pumping equipment required for the proper diversion of sewage and removal of drainage from the work.

2. Whenever the Contractor, at the downstream end of his Contract, removes an existing bulkhead which was placed as part of a previous contract, he must install a screen suitable for the purpose of preventing his construction debris from floating into the completed portions of the sewer system. As his work progresses, he must also clean the completed portions of the sewer by removing rails, jacks, lumber, sandbags and all other construction equipment, excess material and debris.
3. The Contractor must place and maintain all temporary dams, flumes, bulkheads or other structures necessary to prevent water from adjacent sections of the sewer system from entering the work under this Contract in such a manner as to injure it, and must completely remove all such temporary structures from the completed portion of the work as rapidly as practicable. The Contractor must not place a dam, flume or bulkhead in any sewer without first obtaining the approval of the Commissioner. The Contractor must ascertain the possibility of sewage backing up into basements and causing damage and he will be held responsible for any such damage.
4. The City does not assume responsibility for providing the Contractor with an outlet for any storm water or sewage which must be disposed of during the construction work under this Contract. Until the acceptance of the work, the Contractor will, if so ordered by the Commissioner, keep the entire work pumped free of water and sewage and before the acceptance of any part of the work, must clean the entire length of such finished part of the work to the satisfaction of the Commissioner.
5. Water must not be allowed to flow over or stand on the invert in such a manner as to cause scouring of the concrete surface.
6. Water pumped from trenches or other excavations must be routed to settling basins before entering the City of Chicago sewer system. The settling basins will be 5 feet by 10 feet with three (3) compartments or baffles having a minimum depth of 2 feet. Discharge from the settling basin must be by gravity to the catch basin.
7. All costs due to the provisions of this section or by interruption of the work incidental thereto, are to be included in the unit or lump sum prices stated in the proposal.

#### E. FINISHING OF CONTRACT WORK

1. The Contractor must protect the main sewers and sewer manholes from damage that might be inflicted by improper use of installation equipment.

2. The Contractor must ensure that a water tight seal is made at all connections in manholes and apply a seal if the installed cured tube fails to make a water tight seal. The costs for such seals are incidental to the Contract.
3. The Contractor must reconnect all active drain connections and other lateral sewers as directed by the Commissioner without excavation.
4. The Contractor must seal the liner edges between inversions / insertions or at the end of an inversion / insertion to an even thickness with a hydraulic mortar.
5. When the liner is continuous through a manhole, the liner must be trimmed flush with the wall of the bench. The cut edges must be sealed with a hydraulic mortar that adheres to both the wall of the bench and the liner.

#### 3.4 FIELD QUALITY CONTROL

- A. For the sewer liner the water tightness of the sewer liner must be gauged while curing and under a positive pressure head.
- B. At each connection between the service lateral and main sewer pipe the Contractor must test the water tightness of each joint by either conducting an air pressure test or dye water flood test.

#### 3.5 SCHEDULES

- A. The Contractor must submit a schedule clearly depicting the date and duration of both the cleaning and lining work are to the Commissioner for review in accordance with Book 1, "Schedule". No work is to begin until the schedules have been submitted and reviewed by the Commissioner.

END OF SECTION 33 01 30

## **SECTION 33 05 22**

### **REPAIR AND ADJUSTMENT OF SEWER MAINS AND STRUCTURES**

#### **PART 1 - GENERAL**

##### **1.1 DESCRIPTION OF WORK**

- A. This Section includes the requirements associated with the repair, adjustment and abandonment of existing sanitary and storm sewers, house drains, manholes, catch basins and inlets as shown on the Drawings, or as directed by the Commissioner. This Section also includes the requirements for cleaning existing catch basins.

##### **1.2 WORK OF THIS SECTION SPECIFIED ELSEWHERE**

- A. Section 03 30 00 – Cast-In-Place Concrete.
- B. Section 31 23 10 – Excavation, Trenching and Backfilling.
- C. Section 33 31 13 – Sewer Pipe and Fittings.

##### **1.3 REFERENCES**

- A. City of Chicago, Department of Water Management, Standard Specifications for Sewer Construction, latest edition.
- B. Follow the latest edition of the following references.
  - 1. ASTM C700 - Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated.
  - 2. ASTM C425 - Compression Joints for Vitrified Clay Pipe and Fittings.
  - 3. ASTM C76 - Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
  - 4. AWWA C151 - Ductile Iron Pipe, Centrifugally Cast for Water.
  - 5. ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
  - 6. ASTM C478 - Pre-cast Reinforced Concrete. Manhole Sections.
  - 7. ASTM C32 - Sewer and Manhole Brick (Made from Clay or Shale).

8. ASTM A48 - Gray Iron Castings.

## **PART 2 - PRODUCTS**

### **2.1 PIPE AND FITTINGS**

- A. Sewer piping must conform to the requirements of Section 33 31 13 – Sewer Pipe and Fittings.
  1. Sewers 21-Inches in diameter and smaller must be Extra Strength Vitrified Clay Pipe or Ductile Iron Pipe.
  2. Sewers 24-Inches and larger, must be Reinforced Concrete Pipe.

### **2.2 MANHOLES, CATCH BASINS AND INLETS**

- A. Manholes, catch basin and inlets must conform to the requirements of Section 33 39 13 – Sewer Manholes, Catch Basins, Frame and Covers.
- B. Manhole lids and frames, catch basin or inlet frames, grates, and manhole steps must conform to the requirements of Section 33 39 13 – Sewer Manholes, Catch Basins, Frame and Covers.

### **2.3 SEWER BRICK**

- A. Sewer brick must conform to the requirements of Section 33 39 13 – Sewer Manholes, Catch Basins, Frames and Covers.

### **2.4 MORTAR AND GROUT**

- A. Portland Cement Mortar for sealing pipe connections, structures, manholes and catch basin frames must conform to ASTM C150, and be composed of one (1) part Portland cement and one(1) part sand, and minimal amount of water to make a workable mix.



- B. Grout: Portland Cement, Admixtures, and Sand must meet the requirements of Section 03 30 00 – Cast-In-Place Concrete.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Existing sewer facilities disturbed or damaged by the Contractor's operation must be promptly reported to the Department of Water Management, (Sewers Engineering Section) and repaired by the Contractor. All repairs must be done using a licensed drain layer, in conformance with Department requirements, and are considered incidental to the Work of the operation. No additional payment will be allowed for this work.
- B. Sewer pipe used in the repair or adjustment of sewers and sewer structures must be of the same diameter and pipe material as the existing sewer, with the exception of the conditions listed hereafter, unless otherwise directed by the Commissioner.
  - 1. Where water mains cross over existing sewers, house drains, catch basins drain pipes, and where an 18-Inch vertical separation cannot be maintained between the bottom of the water main and top of existing sewer, the existing sewer pipe must be replaced with a ductile iron pipe with rubber gasketed joints comparable to water main standards, for a of perpendicular distance of 10 feet each side of the water main to be crossed.
  - 2. Where the horizontal separation between a water main and existing sewer is less than 10 feet and less than 18-Inches vertically above the crown of the existing sewer pipe, the sewer must be replaced with ductile iron pipe to a distance 10 foot each side of the center line of the water main.
  - 3. If a water main crosses under existing sewers, house drains, or catch basin drains, the sewer must be replaced with ductile iron pipe to a distance of 10 feet either side of the centerline of the water main, and an 18-Inch vertical separation must be maintained.

### **3.2 LAYING SEWERS**

- A. Trenches must be kept free from excess water until the sewer has been installed and mortar joints, if used, have set.
- B. Each pipe and fitting must be inspected for soundness and damage immediately before being laid, and any pipe or fitting not conforming to the requirements of this Section, is rejected and must be removed from the Site at the Contractor's expense.
- C. Each pipe must be laid to the line and grade given by the Department unless directed otherwise by the Commissioner. Pipe must be laid on even firm bedding along the entire bed of the pipe with bedding material shaped to conform to pipe bells or joint sleeves, and so not to bear on pipe bells or joints. Bedding must conform to the requirements of Section 31 23 10 – Excavation, Trenching and Backfilling.
- D. The socket end of the pipe must be laid upgrade.
- E. Pipe must not be trimmed or clipped in order to fit in the socket.
- F. The face of the spigot must be brought into contact with the shoulder of the socket.
- G. The joints must be sealed in accordance with the manufacturer's specifications.
- H. Whenever pipe laying is discontinued, the unfinished end of the sewer must be protected from displacement, cave in, or other injury and a suitable stopper or dam must be placed in the end socket.

### 3.3 MORTAR JOINTS FOR DRAIN CONNECTIONS

- A. Mortar joints used for connections to existing sewer pipes or house drains may be used only when connections cannot be made using gasketed joints as specified or the appropriate pipe adaptor as supplied or recommended by the pipe manufacturer, or as directed otherwise by the Commissioner.
- B. When mortar joints are required, they must be constructed using the following procedure:
  - 1. In joining pipe, the spigot must be centered in the socket by means of a packing gasket of twisted impregnated oakum of proper thickness and sufficient length to pass around the pipe and lap the top.
  - 2. After the pipe has been placed, the gasket must be caulked into the annular space and the remainder of the space filled with Portland cement mortar beveled off with the outside of the socket.
  - 3. Mortar for pipe joints or fittings must be made of one (1) part Portland Cement and one (1) part sand conforming to applicable requirements of Section 03 30 00 – Cast-In-Place Concrete.
  - 4. Only a sufficient amount of mortar may be prepared for use within forty-five (45) minutes of application. Any mortar that has begun to set must not be used.
  - 5. As each joint is completed, the inside of the pipe must be thoroughly cleaned to remove all excess joint material.

### 3.4 EXISTING CATCH BASINS

- A. Thoroughly clean any existing catch basin to remain to its full depth, removing and properly disposing of all material removed from the basin. No material removed from a catch basin must be allowed to enter any City sewer.

- B. Inspect the drain connection from each catch basin and rod-out the drain when said drain is found to have obstructions. Any drain connection found to be defective must be removed and relayed.
- C. The Contractor must install flow restrictors in all existing / proposed catch basins within the project limits (area of pavement resurfacing). Three inch (3") diameter plastic vortex type restrictors must be installed in the residential streets, whereas the same without swirl chamber must be installed in the arterial streets. The Department of Water Management will supply the restrictors, which can be obtained at the Department of Water Management's Central District, located at 3901 S. Ashland Avenue.

### 3.5 REPAIR AND ADJUSTMENT OF STRUCTURES

- A. Remove the existing frames and covers and inspect the existing masonry. Remove and replace defective masonry in the upper portions. Remove or add masonry, as necessary, to meet the elevations established by the Commissioner.
- B. For any manhole or catch basin cover or frame raised more than 6 inches, remove the old masonry for the structure to the point where the manhole or catch basin structure reaches its full internal diameter and rebuild the structure as shown on the Plans.
- C. Material used in each repair and adjustment must be the same type as in the existing manhole, catch basin or inlet, unless otherwise ordered by the Commissioner.
- D. Reset the existing frames and covers on the repaired and adjusted manholes, catch basins and inlets in a full bed of mortar, unless the Commissioner orders that new frames or covers be installed.
- E. Examine the drain connection from each catch basin and inlet, and if such connection is found to be defective, then remove and relay the defective portions as ordered by the Commissioner.

- F. Place granular trench backfill, as described in Section 31 23 10 – Excavation, Trenching and Backfilling, around the repaired and adjusted manholes, catch basins, inlets, valve basins and vaults.

### 3.6 FINAL ADJUSTMENT OF STRUCTURES

- A. To prevent debris from entering the sewers, place 22 gauge galvanized steel plate beneath all perforated lids of all sewer structures prior to the placing of any type of surfacing material. Maintain plates in place until the completion of all paving operation have been completed.
- B. After the base course and binder course have been placed, and prior to placing the surface course, the structures must be adjusted to match the final pavement elevation.
- C. Remove the binder and base course adjacent to and for a distance not exceeding 12-inches outside the base of the castings.
- D. Adjust the castings to final pavement elevation with adjusting rings set in mortar.
- E. Fill the space around the casting with Class SI concrete to the elevation of the surface of the binder course.

### 3.7 ABANDONMENT OF SEWERS AND SEWER STRUCTURES

- A. Fill abandoned sewers, sub-sidewalk space, water tunnels, structures, drains, manholes, catch basins and inlets as shown on the Plans or as ordered by the Commissioner with fine aggregate material meeting the requirements of Section 31 23 10 – Excavation, Trenching and Backfilling. A hole must be drilled every 100 feet in abandoned backfilled sewers and drains that are 15 inches and larger in internal diameters to verify the backfilling and to allow refilling if necessary.
- B. When called for on the Drawings, abandoned sewers must be completely filled with sewer grout or controlled low strength material / flowable fill. Fill abandoned sewers to a point approximately six (6) inches up in the manhole riser above the top of the sewer crown. Care must be taken so as not to fill any drain connection.

END OF SECTION 33 05 22

## **SECTION 33 31 13**

### **SEWER MAIN PIPE AND FITTINGS**

#### **PART 1 - GENERAL**

##### **1.1 DESCRIPTION OF WORK**

- A. This section includes requirements for the installation of sewer mains, service piping and accessories, adjustment of sewer pipes, house drains, manholes, catch basins, inlets and associated appurtenances specified here, shown on the Drawings, or directed by the Commissioner.

##### **1.2 WORK OF THIS SECTION SPECIFIED ELSEWHERE**

- A. Section 31 23 19 - Dewatering Excavations.
- B. Section 31 23 10 - Excavation, Trenching and Backfilling.
- C. Section 03 30 00 - Cast In Place Concrete.
- D. Section 33 39 13 - Sewer Manholes, Catch Basins, Frames and Covers.

##### **1.3 REFERENCES**

- A. American Society for Testing and Materials (ASTM), latest edition:
  - 1. ASTM A74 - Specification for Cast Iron Soil Pipe and Fittings
  - 2. ASTM C12 - Practice for Installing Vitrified Clay Pipe Lines
  - 3. ASTM C14 - Specification for Concrete Sewer, Storm Drain and Culvert Pipe.
  - 4. ASTM C76 - Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
  - 5. ASTM A48 - Gray Iron Castings.
  - 6. ASTM C32 - Sewer and Manhole Brick (Made from Clay or Shale).
  - 7. ASTM C361 - Standard Specification for Reinforced Concrete Low-Head Pressure Pipe
  - 8. ASTM C425 - Specification for Compression Joints for Vitrified Clay Pipe and Fittings.
  - 9. ASTM C443 / AASHTO M198 - Specification for Joints for Circular Concrete Sewer and Culvert Pipe, using Rubber Gaskets.
  - 10. ASTM C506 - Specification for Reinforced Concrete Arch Culvert, Storm Drain and Sewer Pipe.
  - 11. ASTM C507 - Specification for Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe.
  - 12. ASTM C564 - Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
  - 13. ASTM C700 – Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated.

- 14. ASTM C 1173 – Standard Specifications for Flexible Transition Couplings for Underground Piping.
- 15. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
- B. AWWA C151 - Ductile Iron Pipe, Centrifugally Cast for Water, latest edition.
- C. ANSI A21.11 – Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings, latest edition.
- D. AWWA C104 – Cement Mortar Lining for Ductile Iron Pipe and Fittings, latest edition.
- E. AWWA C110 - Ductile-Iron and Gray-Iron Fittings, latest edition.
- F. AWWA C150 - Thickness Design of Ductile-Iron Pipe, latest edition.
- G. AWWA C151 - Ductile Iron Pipe, Centrifugally Cast, latest edition.
- H. IEPA Standard Specifications for Water & Sewer Construction in Illinois, latest edition.

#### 1.4 SUBMITTALS

- A. Reference City of Chicago, Department of Procurement, Book I -“Terms and Conditions for Construction” for submittal requirements and procedures for Shop Drawings, Product Data, Records and Samples.
- B. The Contractor must give notice, in writing to the Commissioner, sufficiently in advance of the intention to commence the purchase and/or manufacture of the pipe for use under this contract.
- C. Before starting fabrication of the pipe and fittings, the Contractor must submit fully dimensioned drawings or catalogs to the Commissioner showing the pipe, joints and fittings to be used in the Work in full detail.
- D. Submit a copy of sewage bypass plan to the Commissioner.
- E. The Contractor must submit to the Commissioner certified copies of all test reports.
- F. The Contractor must provide the Commissioner with a notarized statement that all tests have been made and met as specified here, unless waived by the Commissioner.

#### 1.5 QUALITY ASSURANCE

- A. The contractor must furnish all facilities, personnel, and materials to conduct tests required as applicable to the type of pipe being supplied. The cost of all plant tests required as proof of the acceptability of the material will be considered incidental to the Work and no additional payment will be allowed.



- B. The Work performed on joining all pipe and fittings, must be performed by a licensed drain layer in the City of Chicago. This Work must include, but not be limited to joining all pipe and fittings, coring sewer pipe sections, installing joint gaskets, assembling all joints, installing continuity wedges, and tightening all gland nuts and bolts, as applicable for the installation.
- C. All pipe and fittings must be inspected for soundness and damage due to handling, immediately before being laid and any not conforming to these requirements of this Section is rejected and must be immediately removed from the site.

## **PART 2 – PRODUCTS**

### **2.1 PIPE AND FITTINGS**

#### **A. VITRIFIED CLAY PIPE**

- 1. Vitrified clay pipe and fittings must be extra strength clay bell and spigot pipe conforming to the requirements of ASTM C700.

#### **B. CONCRETE PIPE**

- 1. Non-reinforced concrete pipe and fittings must conform to the requirements of ASTM C14, Class 1, 2 or 3 as noted on the Construction Drawings.

#### **C. REINFORCED CONCRETE PIPE**

- 1. Circular reinforced concrete pipe and fittings must conform to the requirements of ASTM C76, Class III, IV or V, Wall B or Wall C with circular reinforcement. For pipe thirty (30) inches or more in diameter, the length of the unit must not be less than six (6) feet. Elliptical section reinforced concrete pipe and fittings must conform to ASTM C507, minimum class HE-III or HE-IV. Arch section reinforced concrete pipe and fittings must conform to ASTM C506, minimum class A-III or A-IV.
- 2. Preformed tapered holes of the proper dimensions as shown on the Plans for the connection of drains and future drain connections must be provided during the manufacture of the pipe. Tapered holes must be so formed that the drain connection will enter the sewer at an angle of approximately 90 degrees with the axis of the sewer. Whenever the diameter of a preformed tapered hole is equal to or exceeds 50 percent of the diameter of the pipe, additional reinforcement steel satisfactory to the Commissioner must be placed around the hole.
- 3. Selection of Pipe Class for Reinforced Concrete Pipe must comply with Tables 1, 2 or 3 of this Section.

**TABLE 1**  
Required Pipe Class by Diameter and Type for Circular Pipe

PIPE SIZE (INCHES)	TYPE 1 <sup>1</sup>	TYPE 2 <sup>2</sup>	TYPE 3 <sup>3</sup>	TYPE 4 <sup>4</sup>	TYPE 5 <sup>5</sup>	TYPE 6 <sup>6</sup>	TYPE 7
24	IV	III	IV	V	V	V	V
27	IV	III	IV	V	V	V	V
30	III	III	IV	V	V	V	V
36	III	III	IV	IV	V	V	V
42	III	III	IV	IV	V	V	V
48	III	III	IV	IV	V	V	V
54	III	III	IV	IV	V	V	V
60	III	III	IV	IV	V	V	V
66	III	III	III	IV	IV	V	V
72	III	III	III	IV	IV	V	V
78	III	III	III	IV	IV	V	V
84	III	III	III	IV	IV	V	V
90	III	III	III	IV	IV	V	V
96	III	III	III	IV	IV	V	V
102	III	III	III	IV	IV	V	V
108	III	III	III	IV	IV	V	V

**TABLE 2**  
Required Pipe Class by Size and Type for Elliptical Pipe

Equiv. Round Dia. (inches)	Span (inches)	Rise (inches)	Type 1 <sup>1</sup>	Type 2 <sup>2</sup>	Type 3 <sup>3</sup>
24	30	19	HE-IV	HE-III	HE-III
27	34	22	HE-III	HE-III	HE-III
30	38	24	HE-III	HE-III	HE-III
36	45	29	HE-III	HE-III	HE-III
42	53	34	HE-III	HE-III	HE-III
48	60	38	HE-III	HE-III	HE-III
54	68	43	HE-III	HE-III	HE-III
60	76	48	HE-III	HE-III	HE-III
66	83	53	HE-III	HE-III	HE-III
72	91	58	HE-III	HE-III	HE-III

**TABLE 3**  
**Required Pipe Class By Size and Type for Elliptical Pipe**

<b>Equiv. Round Pipe Size (inches)</b>	<b>Span (inches)</b>	<b>Rise (inches)</b>	<b>Type 1 <sup>1</sup></b>	<b>Type 2 <sup>2</sup></b>	<b>Type 3 <sup>3</sup></b>
24	28 1/2	18	A-IV	A-III	A-III
27	36 1/4	22 1/2	A-III	A-III	A-III
30	36 1/4	22 1/2	A-III	A-III	A-III
36	43 3/4	26 5/8	A-III	A-III	A-III
42	51 1/8	31 5/16	A-III	A-III	A-III
48	58 1/2	36	A-III	A-III	A-III
54	65	40	A-III	A-III	A-III
60	73	45	A-III	A-III	A-III
66	88	54	A-III	A-III	A-III
72	88	54	A-III	A-III	A-III

**Notes For Tables 1, 2 & 3:**

1. Type 1 – Depth: 3-feet and <
2. Type 2 – Depth: >3-feet and <10-feet.
3. Type 3 – Depth: 10-feet and <15-feet.
4. Type 4 – Depth: 15-feet and <20-feet.
5. Type 5 – Depth: 20-feet and <25 feet.
6. Type 6 – Depth: 25-feet and <30 feet.
7. Type 7 – Depth: 30-feet and >.

**D. DUCTILE IRON PIPE**

1. Ductile iron pipe must conform to the requirements of AWWA C151, Class 52 and with the additions or substitutions specified in this Section. Fittings must be gray or ductile iron conforming to ASTM C110.
2. Bells must be designed to provide a watertight joint without any leakage and be capable of withstanding pressures exceeding those that will rupture pipe of this class and thickness without requiring additional jointing material.
3. All pipe must be manufactured so that where a cut is made at any point along the barrel, the cut end will fit properly into a standard mechanical joint bell and be drip tight at hydrostatic test pressure.
4. Exterior of pipe and fittings must be coated with a petroleum asphaltic material in conformance with AWWA C110, Section 10-10. Interior of pipe must be cement mortar or ceramic lined in accordance with AWWA C104.

E. MASONRY

1. Sewer brick and mortar must conform to the requirements of Section 33 39 13 – Sewer Manholes, Catch Basins, Frames and Covers.

2.2 PIPE JOINTS

A. VITRIFIED CLAY PIPE

1. Vitrified clay pipe joints must be resilient, compression-type joints conforming to ASTM C425. Joints may be provided in one of the following ways:
  - a. Joints made of polyurethane must have an integral compression ring formed as part of the factory made joint.
  - b. Where rubber gaskets are used, they must be continuous precision molded gaskets manufactured from a compound containing a basic polymer of not less than 50% by volume of isoprene and must contain no vulcanized vegetable oil, reclaimed rubber or dry deleterious substance.

B. CONCRETE PIPE

1. Reinforced and non-reinforced concrete pipe joints must be flexible rubber gasket joint type conforming to ASTM C361, ASTM C443 and AASHTO M198.

C. DUCTILE IRON PIPE

1. Pipe joints must be push-on type joints with rubber gaskets unless otherwise shown on the Drawings, specified, or directed by the Commissioner. Push-on type joints must conform to AWWA C111.

D. PVC JOINTED PIPE

1. For vitrified clay pipe size 12-Inch in diameter or smaller, Contractor may substitute a polyvinyl chloride (PVC) sleeve with a polyurethane jointing material for the joint in 2.2.A. PVC collar conforming to ASTM D1784, Class 12454-B must be installed on the extra strength clay pipe at the factory. The finished joint must meet or surpass all applicable material and performance tests specified for clay pipe joints under ASTM C425.

E. JOINING PIPE OF DISSIMILAR MATERIALS

- 1 For pipes 15-Inches and smaller in diameter, connect pipe of dissimilar material together with manufactured flexible transition couplings specifically made for this purpose, conforming to ASTM C 1173. Transition couplings are to be molded from synthetic elastomeric materials fitted with attached adjustable stainless steel band type clamps to stabilize and seal the joint. Acceptable products are "Band Seal Couplings made by Naylor Inc., "Mission Couplings" made by Mission Rubber Co., or "Fernco Couplings" made by Fernco Systems, Inc.
2. For sewer pipes larger than 15-Inches in diameter, transitions between different pipe materials must be as directed by the Bureau of Sewers.

2.3 POLYETHYLENE ENCASEMENT FOR CAST OR DUCTILE IRON PIPE

- A. For cast iron and ductile iron pipe, polyethylene encasement material must be 4-mil, cross-laminated, high-density polyethylene tubing. The tubing must comply with AWWA C105.

2.4 SEWER CLEANOUTS

- A. At grade cleanouts must be cast iron pipe and have an adjustable sleeve-type housing, a threaded brass plug with countersunk slot and cast iron frame and cover.

2.5 CAST-IN-PLACE CONCRETE

- A. Cast in Place Concrete must conform to the requirement of Section 03 30 00 – Cast-In-Place Concrete.

2.6 PIPE BEDDING

- A. Pipe bedding must conform to requirements set forth in Section 31 23 10 – Excavation, Trenching, and Backfill, of these specifications.

**PART 3 - EXECUTION**

3.1 GENERAL

- A. All pipe, fittings, and appurtenances must be installed in accordance with the manufacturer's recommendations and requirements.
- B. All pipe, fittings, and accessories must be delivered, unloaded, strung, and laid as specified here.

### 3.2 TRANSPORTATION AND DELIVERY OF PIPE, FITTINGS AND STRUCTURES

- A. Every precaution must be taken to prevent damage to the pipe during transportation and delivery. Extreme care must be taken in loading and unloading the pipe and fittings. Such work must be done with the pipe under complete control at all times. Under no conditions may the pipe be dropped, bumped, dragged, pushed, or moved in any way that will cause damage to the pipe.
- B. If in the process of transportation, handling, or installation, any pipe or fitting is damaged, such pipe or fitting must be replaced by the Contractor and be considered incidental to the construction and no additional payment will be allowed.
- C. The Contractor must prevent the pipe from rolling. The procedures used to prevent rolling must be approved by the Commissioner.

### 3.3 SEWAGE DIVERSION

- A. The Contractor must include in his construction procedure adequate means for pumping and diverting all sewage flow around the work area to keep the trench free of water and sewage until all structures, pipe, and connections have been completed. During heavy rains, the Contractor must anticipate additional flow from surface runoff and in existing sewers. The Contractor must be prepared to handle the increased flow under these conditions and protect the new work from damage while keeping all excavations as dry as possible and existing sewers in operation. Any additional pumping needed during times of heavy rainfall will be considered incidental to the cost of the by-pass pumping and will not be considered for additional payment.
- B. No open pumping or discharge of water will be allowed onto City streets. All discharge flows must be discharged via pumping through a closed system of pipelines to an approved discharge point. **It is part of the work of this section for the Contractor to submit a bypass pumping plan for the review and comment of the Department of Water Management, Sewer Section, before starting any work.** The Contractor must provide all temporary flumes or pipe lines and pumping equipment required for the proper diversion of sewage and removal of drainage from the work. Contractor must remove any temporarily-installed dams or bulkheads after completion of the work.
- C. Whenever the Contractor, at the downstream end of his Contract, removes an existing bulkhead which was placed as part of a previous contract, he must install a screen suitable for the purpose of preventing his construction debris from floating into the completed portions of the sewer system. As his work progresses, he must also clean the completed portions of the sewer by

removing rails, jacks, lumber, sandbags and all other construction equipment, excess material and debris.

- D. The Contractor must place and maintain all temporary dams, flumes, bulkheads or other structures necessary to prevent water from adjacent sections of the sewer system from entering the work under this Contract in such a manner as to injure it, and must completely remove all such temporary structures from the completed portion of the work as rapidly as practicable. The Contractor must not place a dam, flume or bulkhead in any sewer without first obtaining the approval of the Commissioner. The Contractor must ascertain the possibility of sewage backing up into basements and causing damage and he will be held responsible for any such damage.
- E. The City does not assume responsibility for providing the Contractor with an outlet for any storm water or sewage which must be disposed of during the construction work under this Contract. Until the acceptance of the work, the Contractor will, if so ordered by the Commissioner, keep the entire work pumped free of water and sewage and before the acceptance of any part of the work, must clean the entire length of such finished part of the work to the satisfaction of the Commissioner.
- F. Water must not be allowed to flow over or stand on the invert in such a manner as to cause scouring of the concrete surface.
- G. Water pumped from trenches or other excavations must be routed to settling basins before entering the City of Chicago sewer system. The settling basins must be 5 feet by 10 feet with three compartments or baffles having a minimum depth of 2 feet. Discharge from the settling basin must be by gravity to the catch basin.

### 3.4 STORAGE OF CONCRETE PIPE AND STRUCTURES

- A. In order to minimize inconvenience to adjacent property owners, the Contractor must not store pipe or structures on the job site for a distance of more than 600 feet ahead of the trench excavation. Stacking of concrete pipe is not allowed.

### 3.5 PREPARATION FOR LAYING PIPE

- A. Materials, coatings, and linings must be as specified and as shown. Installation must be in accordance with standards as recommended by the pipe manufacturer, and as specified here.
- B. Proper and suitable tools and appliances for the safe and convenient cutting, handling, and laying of the pipe and fittings must be used.

- C. Before laying, all pipe and fittings must be thoroughly examined for defects and no piece may be installed which is known to be defective. If defects are discovered after pipe or fittings have been installed, the Contractor must remove the defective pipe or fitting and replace it with a sound one in a satisfactory manner.
- D. The pipe and fittings must be thoroughly cleaned before they are laid and must be kept clean until they are accepted in the finished work. Care must be exercised to avoid leaving bits of wood, dirt, rock and other foreign particles in the pipe. If any such materials are discovered before the final acceptance of the work, they must be removed and the pipe and fittings replaced, if necessary. All pipes must be kept absolutely clean during construction and must be stopped off with night plugs at the end of each day's work.
- E. Excavate pipe trenches as specified in Section 31 23 10 – Excavation, Trenching and Backfilling. Hand trim bottom of trench to six (6) inches below bottom of pipe.
- F. Place and compact pipe bedding as specified in Section 31 23 10 Excavation, Trenching and Backfilling.
- G. Keep trench bottom free from excess water. Groundwater or water from other sources must be removed as per Section 31 23 19 – Dewatering Excavations. If the trench bottom is unsuitable for the pipes foundation, the kind of stabilization to be utilized will be ordered in writing.
- H. If, in the opinion of the Commissioner, the Contractor has failed to obtain an acceptably dry trench bottom using conventional methods of dewatering, the Commissioner may order the Contractor to excavate below the intended grade and to place sufficient sub-grade material as may be suitable over the trench bottom in accordance with Section 31 23 10 – Excavation, Trenching and Backfilling.

### 3.6 LAYING PIPE

- A. Lay pipe to line and grade in prepared bedding as indicated on the Drawings. The pipe must be properly secured against movement and pipe joints must be made in the excavation as required. Pipe must have compacted bearing along its entire length. When completed, the sewer must have a smooth and uniform invert.
- B. The pipe laying must begin at the downstream end of the pipe. Install pipe so that bells and grooves are on the upstream end. Install vitrified clay pipe in accordance with the requirements of ASTM C12.
- C. Prevent dirt, rock and other foreign particles from getting into the open end of the pipe and any pipe joints.



- D. Clean interior of pipe of cement, dirt and extraneous material as the work progresses.
- E. Lateral and service connections are to be made with manufactured wye fittings or preformed tapered holes or field cored holes. Openings for service connections are to be at an elevation between seven (7) feet and eight (8) feet below the ground grade.

### 3.7 DRAIN CONNECTIONS

- A. Each slant, tapered hole or wye branch and new drain connection must be the same size as the existing drain or sewer unless otherwise shown on the Plans or ordered by the Commissioner.
- B. If existing cast-iron drains are encountered which must be connected to the new sewers, the Contractor must furnish and place cast-iron pipe and fittings as required or as ordered by the Commissioner.
- C. That portion of each drain connection and drain stack between the barrel of the sewer and the side of the trench must be encased and supported on a concrete or masonry pier as shown on the Plans, except that 8-inch drain connections from catch basins where such catch basins are located within the lines of the sewer trench must be supported on trench backfill. Drain connections constructed outside the neat lines of the sewer trench must be placed on a minimum of six (6) inches of granular embedment as described in Section 31 23 10 – Excavation, Trenching and Backfilling.
- D. Drain stacks for future drain connections must have socket ends closed by suitable stoppers mortared in place.
- E. The Contractor must examine all house drains, catch basin outlets and other existing drains or sewers to be connected to the new sewers, and if any such drain is found defective, as determined by the Commissioner, the Contractor must remove and relay the defective portions in accordance with the Specifications.

### 3.8 PIPE JOINTS

- A. Pipe joints must be made secure and watertight.
- B. Employ appropriate equipment to draw the sections of the pipe tightly together.
- C. Apply lubricant to rubber gaskets immediately before joining pipe sections.
- D. Joints of bell-and-spigot pipe and tongue and groove pipe must be filled with cement mortar so as to make a strong and watertight joint. Finish joints smooth on inside of pipe with cement mortar.

- E. Inside joint recesses of pipe shall be filled with cement mortar prior to closure of the joint. After closure is made, the joint must be pointed inside of the pipe and excess mortar removed.
- F. Inspect each joint for proper assembly prior to backfilling.
- G. Mortar joints used for connections to existing sewer pipes or house drains may be used only when connections cannot be made using gasketed joints as specified or the appropriate pipe adaptor as supplied or recommended by the pipe manufacturer, or as directed otherwise by the Commissioner.
  - 1. When mortar joints are required, they must be constructed to the following standards:
  - 2. Center spigot of pipe in the socket using a packing gasket of twisted impregnated oakum of proper thickness and sufficient length to pass around the pipe and lap the top.
  - 3. After the pipe has been placed, caulk the gasket into the annular space and fill the remainder of the space with Portland cement mortar beveled off with the outside of the socket.
  - 4. Mortar for pipe joints or fittings must be made of one (1) part Portland Cement and one (1) part sand conforming to applicable requirements of Section 03 30 00 – Cast In Place Concrete.
  - 5. Only a sufficient amount of mortar may be prepared for use within forty-five (45) minutes of application. Any mortar that has begun to set must not be used.
  - 6. As each joint is completed, thoroughly clean the inside of the pipe to remove all excess joint material.

### 3.9 CLEAN OUTS

- A. Risers must be the same size as the pipe, and must consist of a wye or 1/8 bend extended to another 1/8 bend to the cleanout housing.

### 3.10 TEMPORARY BULKHEADS

- A. At ends of constructed sections where adjoining mains or structures have not been completed and are not ready to be connected, construct temporary bulkheads.

### 3.11 SHORT TUNNEL CONSTRUCTION

- A. Pipes to be placed in short tunnels must be jointed prior to being pulled into position. Pipe must be pushed or pulled into position in a manner arranged to keep joints tight and to prevent deflection.

### 3.12 ENCASING DUCTILE IRON PIPE IN POLYETHYLENE

- A. Encase all cast and ductile iron pipe and fittings encased in polyethylene tubing.

### 3.13 SEPARATION BETWEEN WATER AND SEWER MAINS

- A. When a sewer main crosses below water main and the vertical separation is between 18 and 6-Inches, as measured between the bottom of the water main and crown of sewer pipe, the sewer must be constructed of ductile iron pipe with rubber gasketed joints to a distance one foot beyond the wall of the trench excavation. Flexible transition coupling must be used to join the ductile iron pipe to the sewer pipe and be encased in betonite as shown on the drawings.
- B. When a sewer main crosses above a water main, the sewer pipe must be constructed of ductile iron pipe with rubber gasket joints for a perpendicular distance of 10 feet on either side of the centerline of the water main pipe, and an 18-Inch vertical separation must be maintained. Flexible transition coupling must be used to join the ductile iron pipe to the sewer pipe.

END OF SECTION 33 31 13

## **SECTION 33 39 13**

### **SEWER MANHOLES, CATCH BASINS, INLETS AND SPECIAL STRUCTURES**

#### **PART 1 – GENERAL**

##### **1.1 DESCRIPTION OF WORK**

- A. This Section includes the requirements for constructing and/or adjusting of sewer manholes, catch basins, inlets, junction chambers, tumbling basins, and other structures constructed of cast-in-place or precast concrete, or masonry structures shown on the drawings and specified here.

##### **1.2 WORK OF THIS SECTION SPECIFIED ELSEWHERE**

- A. Section 05 10 00 - Structural and Miscellaneous Steel.
- B. Section 31 23 10 - Excavation, Trenching and Backfilling.
- C. Section 31 23 19 - Dewatering Excavations.
- D. Section 03 30 00 - Cast-In-Place Concrete.
- E. Section 33 05 22 - Repairing, Adjusting, Cleaning and Abandoning Sewer Pipe and Structures.
- F. Section 33 31 13 - Installation of Sewer Main Pipe and Fittings.

##### **1.3 REFERENCES**

- A. American Society for Testing and Materials (ASTM), latest edition:

- 1. ASTM A48 - Standard Specification for Gray Iron Castings.
- 2. ASTM A185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete Reinforcement.
- 3. ASTM A197 - Standard Specification for Cupola Malleable Iron.
- 4. ASTM A536 - Standard Specification for Ductile Iron Castings.
- 5. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
- 6. ASTM C32 - Standard Specification for Sewer and Manhole Brick.
- 7. ASTM C55 - Standard Specification for Concrete Building Brick.
- 8. ASTM C139 - Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
- 9. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes Using Rubber Gaskets.
- 10. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.
- 11. ASTM C857 – Standard Practice for Minimum Structural Design Loading for Underground Pre-cast Concrete Utility Structures.
- 12. ASTM C858 – Standard Specifications for Underground Precast Concrete Utility Structures.

- 13. ASTM C990 - Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants.
- B. IDOT Standard Specification for Road and Bridge Construction (SSRBC), latest edition.
- C. American Association of State Highway Transportation Officials, Standard Specifications for Highway (AASHTO), latest edition.

#### 1.4 SUBMITTALS

- A. Refer to Book I for submittal requirements and procedures for Shop Drawings, Product Data, Records and Samples.
- B. Shop Drawings: When not indicated on the Contract Drawings in sufficient detail or definition, submit detailed drawings of cast-in-place and precast concrete utility structures and related metal work.
- C. Product Data: Submit manufacturers' product data for standard manufactured precast concrete sections and structures, for metal gratings and covers, and for other, related miscellaneous metal items.
- D. Certification: Submit certification or other acceptable evidence that covers and grates to be provided for roadways and parking areas meet proof-testing requirements for AASHTO H20 traffic loading.

### **PART 2 - PRODUCTS**

#### 2.1 PRECAST CONCRETE STRUCTURES

- A. Precast concrete base and riser sections furnished for manholes, valve basins, catch basins and other structures must conform to ASTM C478.
- B. Furnish riser sections in various heights, including an offset tapered section, as detailed on the Drawings, or as directed by the Commissioner.
- C. Precast reinforced concrete flat slab tops for manholes must conform to ASTM C857, and be designed to accommodate a minimum AASHTO loading of H 20, unless directed otherwise by the Commissioner.

#### 2.2 JOINT SEALANTS

- A. Rubber gaskets must conform to ASTM C443.
- B. Preformed butyl rubber flexible rope type gaskets must conform to ASTM C990.

## 2.3 ADJUSTING RINGS

- A. Adjusting rings are to be precast concrete with sufficient steel reinforcing to prevent cracking in normal handling and use.
- B. Mating Faces: Must be smooth, parallel, free from cracks, chips, spalls or casting irregularities which interfere with creating a watertight mating surface between the adjusting ring and top of the utility structure.
  - 1. Provide grooves in faces to contain extrudible preformed gasket material when applicable.

## 2.4 CASTINGS

- A. Iron castings are to be ductile iron castings conforming to ASTM A536, Grade 60-40-18, or gray iron conforming to ASTM A48, free from blowholes, shrinkage, cracks and other defects.
- B. Allowance for shrinkage must be made in the patterns to meet the specified thickness. Frames and lids are to seat at all points.
- C. Malleable castings are to conform to ASTM A197.
- D. All castings are to be made accurately to dimensions shown on the plans, and planed, filed, or ground where otherwise necessary to secure flat and true surfaces.

## 2.5 STEPS

- A. Aluminum alloy WP 6061 or WP 6063 conforming to ASTM B361. Coat the portion of aluminum step embedded in concrete and the portion extending two (2) inches beyond embedment with bituminous paint.

## 2.6 CAST-IN-PLACE CONCRETE

- A. Concrete in accordance with Section 03 30 00 – Cast-In-Place Concrete.

## 2.7 CONCRETE AND MASONRY BLOCKS AND BRICKS

- A. Precast concrete brick must conform to ASTM C55 quality designated Grade N-1.
- B. Sewer brick must conform to the qualifications for “brick for sewers or drainage structures”, Grades SS or SM, as established in Table I of the current ASTM C32, except where modified here.

1. Brick must be uniform, sound, hard burned, of compact texture, free from lime and cracks with a clear ringing sound when struck, whole and with edges full and square, and of standard dimensions.
2. Brick, when thoroughly dried and immersed in water for twenty-four (24) hours, must not absorb more than 15% by weight of water.
3. If in any load of brick more than 10% are inferior, the whole load is rejected.
4. If in any load of brick less than 10% are inferior, the brick is accepted provided the Contractor pulls out all inferior bricks, and immediately removes them from the Site of the Work.

## 2.8 MORTAR

- A. Mortar for brickwork is to be composed of one (1) part Portland cement and two (2) parts screened sand.
  1. Portland cement must conform to the requirements of Section 1001 of the SSRBC.
  2. Sand must be Class A quality and Gradation FA-9 as specified in Article 1003.02 of the SSRBC.
- B. The cement and sand must be proportioned by volume and thoroughly mixed in a tight box.
- C. After the initial mixing, water is to be added gradually and the ingredients mixed until the mortar is of proper consistency. The amount of water must be no more than necessary to produce a workable, plastic mortar.
- D. Prepare only a sufficient amount of mortar for immediate use and any mortar that has begun to set must not be retempered or used in any way in the Work

## 2.9 REINFORCING STEEL

- A. Reinforcing steel is to meet the requirements of ASTM A615, Grade 60 and A185 for wire fabric.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Excavate, backfill and compact in accordance with Section 31 23 10 - Excavation, Trenching and Backfilling.
- B. All brick must be thoroughly wetted immediately before being laid.
- C. Old brickwork must be thoroughly cleaned and wetted before new work is jointed thereto.
- D. No masonry work is to be done when the temperature is below 33° F unless otherwise approved, and then only under conditions for protecting it from frost.

### **3.2 PRE-CAST STRUCTURE INSTALLATION**

- A. Carefully place precast sections for all structures on prepared bedding so as to fully and uniformly support the structure and allow pipes to be laid to proper grade.
- B. All lift holes on precast sections must be completely filled with mortar, smoothed on both inside and outside surfaces.
- C. Seal joints between riser sections with approved mastic sealant or rubber gaskets, or as directed by the Commissioner.
- D. Place one adjusting ring (only) on manhole top. Select thickness of adjusting ring to bring completed structure to required elevation.
- E. Seal joints between adjusting rings and frames with approved mastic sealant before backfilling structures.
- F. Install manhole frame and cover.

### **3.3 MASONRY STRUCTURE INSTALLATION**

- A. Install precast concrete or cast in place base as shown on the Drawings.
- B. Thoroughly wet all brick immediately before laying.
- C. Lay brick courses to the line, straight and parallel, breaking joints with those in adjacent courses.
- D. Lay brick radially as headers in a full bed of mortar with joints not exceeding 3/8-Inch in thickness.



- E. Fill joints with mortar. Interior joints must be trowel-struck.

END OF SECTION 33 39 13

APPENDIX D  
ILLINOIS DEPARTMENT OF TRANSPORTATION  
SPECIAL PROVISIONS

INDEX  
FOR  
SUPPLEMENTAL SPECIFICATIONS  
AND RECURRING SPECIAL PROVISIONS

Adopted January 1, 2017

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

ERRATA    Standard Specifications for Road and Bridge Construction (Adopted 4-1-16) (Revised 1-1-17)

SUPPLEMENTAL SPECIFICATIONS

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403 Bituminous Surface Treatment (Class A-1, A-2, A-3) .....	2
420 Portland Cement Concrete Pavement .....	3
502 Excavation for Structures .....	5
503 Concrete Structures .....	7
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586 Sand Backfill for Vaulted Abutments .....	12
670 Engineer's Field Office and Laboratory .....	14
704 Temporary Concrete Barrier .....	15
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1003 Fine Aggregates .....	18
1004 Coarse Aggregates .....	19
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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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1	<input type="checkbox"/> Additional State Requirements for Federal-Aid Construction Contracts	26
2	<input type="checkbox"/> Subletting of Contracts (Federal-Aid Contracts)	29
3	<input type="checkbox"/> EEO	30
4	<input type="checkbox"/> Specific EEO Responsibilities Non Federal-Aid Contracts	40
5	<input type="checkbox"/> Required Provisions - State Contracts	45
6	<input type="checkbox"/> Asbestos Bearing Pad Removal	51
7	<input type="checkbox"/> Asbestos Waterproofing Membrane and Asbestos Hot-Mix Asphalt Surface Removal	52
8	<input type="checkbox"/> Temporary Stream Crossings and In-Stream Work Pads	53
9	<input type="checkbox"/> Construction Layout Stakes Except for Bridges	54
10	<input type="checkbox"/> Construction Layout Stakes	57
11	<input type="checkbox"/> Use of Geotextile Fabric for Railroad Crossing	60
12	<input type="checkbox"/> Subsealing of Concrete Pavements	62
13	<input type="checkbox"/> Hot-Mix Asphalt Surface Correction	66
14	<input type="checkbox"/> Pavement and Shoulder Resurfacing	68
15	<input type="checkbox"/> Patching with Hot-Mix Asphalt Overlay Removal	69
16	<input type="checkbox"/> Polymer Concrete	70
17	<input type="checkbox"/> PVC Pipeliner	72
18	<input type="checkbox"/> Bicycle Racks	73
19	<input type="checkbox"/> Temporary Portable Bridge Traffic Signals	75
20	<input type="checkbox"/> Work Zone Public Information Signs	77
21	<input type="checkbox"/> Nighttime Inspection of Roadway Lighting	78
22	<input type="checkbox"/> English Substitution of Metric Bolts	79
23	<input type="checkbox"/> Calcium Chloride Accelerator for Portland Cement Concrete	80
24	<input type="checkbox"/> Quality Control of Concrete Mixtures at the Plant	81
25	<input checked="" type="checkbox"/> Quality Control/Quality Assurance of Concrete Mixtures	89
26	<input type="checkbox"/> Digital Terrain Modeling for Earthwork Calculations	105
27	<input type="checkbox"/> Reserved	107
28	<input type="checkbox"/> Preventive Maintenance - Bituminous Surface Treatment	108
29	<input type="checkbox"/> Preventive Maintenance - Cape Seal	114
30	<input type="checkbox"/> Preventive Maintenance - Micro-Surfacing	129
31	<input type="checkbox"/> Preventive Maintenance - Slurry Seal	140
32	<input type="checkbox"/> Temporary Raised Pavement Markers	149
33	<input type="checkbox"/> Restoring Bridge Approach Pavements Using High-Density Foam	150
34	<input type="checkbox"/> Portland Cement Concrete Inlay or Overlay	153

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

<u>Check Sheet #</u>		<u>Page No.</u>
LRS 1	<b>Reserved</b>	158
LRS 2	<input type="checkbox"/> Furnished Excavation	159
LRS 3	<input checked="" type="checkbox"/> Work Zone Traffic Control Surveillance	160
LRS 4	<input checked="" type="checkbox"/> Flaggers in Work Zones	161
LRS 5	<input type="checkbox"/> Contract Claims	162
LRS 6	<input type="checkbox"/> Bidding Requirements and Conditions for Contract Proposals	163
LRS 7	<input type="checkbox"/> Bidding Requirements and Conditions for Material Proposals	169
LRS 8	<b>Reserved</b>	175
LRS 9	<input type="checkbox"/> Bituminous Surface Treatments	176
LRS 10	<b>Reserved</b>	177
LRS 11	<input type="checkbox"/> Employment Practices	178
LRS 12	<input type="checkbox"/> Wages of Employees on Public Works	180
LRS 13	<input type="checkbox"/> Selection of Labor	182
LRS 14	<input type="checkbox"/> Paving Brick and Concrete Paver Pavements and Sidewalks	183
LRS 15	<input type="checkbox"/> Partial Payments	186
LRS 16	<input type="checkbox"/> Protests on Local Lettings	187
LRS 17	<input type="checkbox"/> Substance Abuse Prevention Program	188
LRS 18	<input type="checkbox"/> Multigrade Cold Mix Asphalt	189

**BDE SPECIAL PROVISIONS**  
For the August 4 and September 22, 2017 Lettings

The following special provisions indicated by an "x" are applicable to this contract and will be included by the Project Development and Implementation Section of the BD&E. An \* indicates a new or revised special provision for the letting.

<u>File</u> <u>Name</u>	<u>#</u>	<u>Special Provision Title</u>	<u>Effective</u>	<u>Revised</u>
80099	1	Accessible Pedestrian Signals (APS)	April 1, 2003	Jan. 1, 2014
80382	2	Adjusting Frames and Grates	April 1, 2017	
80274	3	Aggregate Subgrade Improvement	April 1, 2012	April 1, 2016
80192	4	Automated Flagger Assistance Device	Jan. 1, 2008	
* 80173	5	Bituminous Materials Cost Adjustments	Nov. 2, 2006	Aug. 1, 2017
80241	6	Bridge Demolition Debris	July 1, 2009	
5026I	7	Building Removal-Case I (Non-Friable and Friable Asbestos)	Sept. 1, 1990	April 1, 2010
5048I	8	Building Removal-Case II (Non-Friable Asbestos)	Sept. 1, 1990	April 1, 2010
5049I	9	Building Removal-Case III (Friable Asbestos)	Sept. 1, 1990	April 1, 2010
5053I	10	Building Removal-Case IV (No Asbestos)	Sept. 1, 1990	April 1, 2010
80366	11	Butt Joints	July 1, 2016	
* 80384	12	Compensable Delay Costs	June 2, 2017	
80198	13	Completion Date (via calendar days)	April 1, 2008	
80199	14	Completion Date (via calendar days) Plus Working Days	April 1, 2008	
80293	15	Concrete Box Culverts with Skews > 30 Degrees and Design Fills ≤ 5 Feet	April 1, 2012	July 1, 2016
80311	16	Concrete End Sections for Pipe Culverts	Jan. 1, 2013	April 1, 2016
80277	17	Concrete Mix Design – Department Provided	Jan. 1, 2012	April 1, 2016
80261	18	Construction Air Quality – Diesel Retrofit	June 1, 2010	Nov. 1, 2014
80029	19	Disadvantaged Business Enterprise Participation	Sept. 1, 2000	July 2, 2016
80378	20	Dowel Bar Inserter	Jan. 1, 2017	
* 80229	21	Fuel Cost Adjustment	April 1, 2009	Aug. 1, 2017
80304	22	Grooving for Recessed Pavement Markings	Nov. 1, 2012	Aug. 1, 2014
80246	23	Hot-Mix Asphalt – Density Testing of Longitudinal Joints	Jan. 1, 2010	April 1, 2016
80347	24	Hot-Mix Asphalt – Pay for Performance Using Percent Within Limits – Jobsite Sampling	Nov. 1, 2014	April 1, 2017
* 80383	25	Hot-Mix Asphalt – Quality Control for Performance	April 1, 2017	April 2, 2017
80376	26	Hot-Mix Asphalt – Tack Coat	Nov. 1, 2016	
80367	27	Light Poles	July 1, 2016	
80368	28	Light Tower	July 1, 2016	
80336	29	Longitudinal Joint and Crack Patching	April 1, 2014	April 1, 2016
80369	30	Mast Arm Assembly and Pole	July 1, 2016	
80045	31	Material Transfer Device	June 15, 1999	Aug. 1, 2014
80165	32	Moisture Cured Urethane Paint System	Nov. 1, 2006	Jan. 1, 2010
80349	33	Pavement Marking Blackout Tape	Nov. 1, 2014	April 1, 2016
80371	34	Pavement Marking Removal	July 1, 2016	
80377	35	Portable Changeable Message Signs	Nov. 1, 2016	April 1, 2017
80359	36	Portland Cement Concrete Bridge Deck Curing	April 1, 2015	Jan. 1, 2017
80338	37	Portland Cement Concrete Partial Depth Hot-Mix Asphalt Patching	April 1, 2014	April 1, 2016
* 80385	38	Portland Cement Concrete Sidewalk	Aug. 1, 2017	
80300	39	Preformed Plastic Pavement Marking Type D - Inlaid	April 1, 2012	April 1, 2016
80328	40	Progress Payments	Nov. 2, 2013	
3426I	41	Railroad Protective Liability Insurance	Dec. 1, 1986	Jan. 1, 2006
80157	42	Railroad Protective Liability Insurance (5 and 10)	Jan. 1, 2006	
80306	43	Reclaimed Asphalt Pavement (RAP) and Reclaimed Asphalt Shingles (RAS)	Nov. 1, 2012	April 1, 2016

<u>File Name</u>	<u>#</u>	<u>Special Provision Title</u>	<u>Effective</u>	<u>Revised</u>
80340	44	Speed Display Trailer	April 2, 2014	Jan. 1, 2017
* 80127	45	Steel Cost Adjustment	April 2, 2004	Aug. 1, 2017
80379	46	Steel Plate Beam Guardrail	Jan. 1, 2017	
80317	47	Surface Testing of Hot-Mix Asphalt Overlays	Jan. 1, 2013	April 1, 2016
80298	48	Temporary Pavement Marking (NOTE: This special provision was previously named "Pavement Marking Tape Type IV".)	April 1, 2012	April 1, 2017
20338	49	Training Special Provisions	Oct. 15, 1975	
80318	50	Traversable Pipe Grate	Jan. 1, 2013	April 1, 2014
80381	51	Traffic Barrier Terminal, Type 1 Special	Jan. 1, 2017	
80380	52	Tubular Markers	Jan. 1, 2017	
80288	53	Warm Mix Asphalt	Jan. 1, 2012	April 1, 2016
80302	54	Weekly DBE Trucking Reports	June 2, 2012	April 2, 2015
80071	55	Working Days	Jan. 1, 2002	

The following special provisions have been deleted from use:

#### 80289 Wet Reflective Thermoplastic Pavement Marking

The following special provisions are in the 2017 Supplemental Specifications and Recurring Special Provisions.

<u>File Name</u>	<u>Special Provision Title</u>	<u>New Location</u>	<u>Effective</u>	<u>Revised</u>
80360	Coarse Aggregate Quality	Article 1004.01	July 1, 2015	
80363	Engineer's Field Office	Article 670.07	April 1, 2016	
80358	Equal Employment Opportunity	Recurring CS #1 and #5	April 1, 2015	
80364	Errata for the 2016 Standard Specifications	Supplemental	April 1, 2016	
80342	Mechanical Side Tie Bar Inserter	Articles 420.03, 420.05, and 1103.19	Aug. 1, 2014	April 1, 2016
80370	Mechanical Splicers	Article 1006.10	July 1, 2016	
80361	Overhead Sign Structures Certification of Metal Fabricator	Article 106.08	Nov. 1, 2015	April 1, 2016
80365	Pedestrian Push-Button	Article 888.03	April 1, 2016	
80353	Portland Cement Concrete Inlay or Overlay	Recurring CS #34	Jan. 1, 2015	April 1, 2016
80372	Preventive Maintenance – Bituminous Surface Treatment (A-1)	Recurring CS #28	Jan. 1, 2009	July 1, 2016
80373	Preventive Maintenance – Cape Seal	Recurring CS #29	Jan. 1, 2009	July 1, 2016
80374	Preventive Maintenance – Micro-Surfacing	Recurring CS #30	Jan. 1, 2009	July 1, 2016
80375	Preventive Maintenance – Slurry Seal	Recurring CS #31	Jan. 1, 2009	July 1, 2016
80362	Steel Slag in Trench Backfill	Articles 1003.01 and 1003.04	Jan. 1, 2016	
80355	Temporary Concrete Barrier	Articles 704.02, 704.04, 704.05, and 704.06	Jan. 1, 2015	July 1, 2015

The following special provisions require additional information from the designer. The additional information needs to be submitted as a separate document. The Project Development and Implementation section will then include the information in the applicable special provision. The Special Provisions are:

- Bridge Demolition Debris
- Building Removal - Case I
- Building Removal – Case II
- Building Removal - Case III
- Building Removal-Case IV
- Completion Date
- Completion Date Plus Working Days
- DBE Participation
- Material Transfer Device
- Railroad Protective Liability Insurance
- Training Special Provisions
- Working Days

## BUTT JOINTS (BDE)

Effective: July 1, 2016

Add the following to Article 406.08 of the Standard Specifications.

- “(c) Temporary Plastic Ramps. Temporary plastic ramps shall be made of high density polyethylene meeting the properties listed below. Temporary plastic ramps shall only be used on roadways with permanent posted speeds of 55 mph or less. The ramps shall have a minimum taper rate of 1:30 (V:H). The leading edge of the plastic ramp shall have a maximum thickness of 1/4 in. (6 mm) and the trailing edge shall match the height of the adjacent pavement  $\pm$  1/4 in. ( $\pm$  6 mm).

The ramp will be accepted by certification. The Contractor shall furnish a certification from the manufacturer stating the temporary plastic ramp meets the following requirements.

Physical Property	Test Method	Requirement
Melt Index	ASTM D 1238	8.2 g/10 minutes
Density	ASTM D 1505	0.965 g/cc
Tensile Strength @ Break	ASTM D 638	2223 psi (15 MPa)
Tensile Strength @ Yield	ASTM D 638	4110 psi (28 MPa)
Elongation @ Yield <sup>1/</sup> , percent	ASTM D 638	7.3 min.
Durometer Hardness, Shore D	ASTM D 2240	65
Heat Deflection Temperature, 66 psi	ASTM D 648	176 °F (80 °C)
Low Temperature Brittleness, F <sub>50</sub>	ASTM D 746	<-105 °F (<-76 °C)

1/ Crosshead speed -2 in./minute

The temporary plastic ramps shall be installed according to the manufacturer's specifications and fastened with anchors meeting the manufacturer's recommendations. Temporary plastic ramps that fail to stay in place or create a traffic hazard shall be replaced immediately with temporary HMA ramps at the Contractor's expense.”



## 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 <sup>1/</sup>	600-749	2002
	750 and up	2006
June 1, 2011 <sup>2/</sup>	100-299	2003
	300-599	2001
	600-749	2002
	750 and up	2006
June 1, 2012 <sup>2/</sup>	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

## HOT-MIX ASPHALT - DENSITY TESTING OF LONGITUDINAL JOINTS (BDE)

Effective: January 1, 2010

Revised: April 1, 2016

Description. This work shall consist of testing the density of longitudinal joints as part of the quality control/quality assurance (QC/QA) of hot-mix asphalt (HMA). Work shall be according to Section 1030 of the Standard Specifications except as follows.

Quality Control/Quality Assurance (QC/QA). Delete the second and third sentence of the third paragraph of Article 1030.05(d)(3) of the Standard Specifications.

Add the following paragraphs to the end of Article 1030.05(d)(3) of the Standard Specifications:

“Longitudinal joint density testing shall be performed at each random density test location. Longitudinal joint testing shall be located at a distance equal to the lift thickness or a minimum of 4 in. (100 mm), from each pavement edge. (i.e. for a 5 in. (125 mm) lift the near edge of the density gauge or core barrel shall be within 5 in. (125 mm) from the edge of pavement.) Longitudinal joint density testing shall be performed using either a correlated nuclear gauge or cores.

- a. Confined Edge. Each confined edge density shall be represented by a one-minute nuclear density reading or a core density and shall be included in the average of density readings or core densities taken across the mat which represents the Individual Test.
- b. Unconfined Edge. Each unconfined edge joint density shall be represented by an average of three one-minute density readings or a single core density at the given density test location and shall meet the density requirements specified herein. The three one-minute readings shall be spaced **10 ft (3 m)** apart longitudinally along the unconfined pavement edge and centered at the random density test location.”

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

“Mixture Composition	Parameter	Individual Test (includes confined edges)	Unconfined Edge Joint Density Minimum
IL-4.75	Ndesign = 50	93.0 – 97.4% <sup>1/</sup>	91.0%
IL-9.5	Ndesign = 90	92.0 – 96.0%	90.0%
IL-9.5, IL-9.5L	Ndesign < 90	92.5 – 97.4%	90.0%
IL-19.0	Ndesign = 90	93.0 – 96.0%	90.0%
IL-19.0, IL-19.0L	Ndesign < 90	93.0 <sup>2/</sup> – 97.4%	90.0%
SMA	Ndesign = 50 & 80	93.5 – 97.4%	91.0%”

## **HOT-MIX ASPHALT – TACK COAT (BDE)**

Effective: November 1, 2016

Revise Article 1032.06(a) of the Standard Specifications to read:

“(a) Anionic Emulsified Asphalt. Anionic emulsified asphalts shall be according to AASHTO M 140. SS-1h emulsions used as a tack coat shall have the cement mixing test waived.”

80376

# SPECIAL PROVISIONS CHECK LIST

## Generated - 4/24/17 Revised – 5/1/17

**Designer:**  
**Contract No.:**

**C-880036-04**

**FAP:**  
**Section:**  
**County:**

**1405**  
**98-B7106-04-RS**  
**Cook**

√	Dir	File Name	Spec Title	Spec Dates
	DES\	<a href="#">1048945R.DOC</a>	Maintenance of Roadways	E 9/30/85 R 11/1/96
	DES\	<a href="#">1078948R.DOC</a>	Tollway Permit and Bond	E 01/13/89
	DES\	<a href="#">1080301.doc</a>	Restriction on Working Days After a Completion Date	E 01/21/03 R 01/01/07
	DES\	<a href="#">1086587r.doc</a>	Failure to Complete the Work on Time	E 09/30/85 R 01/01/07
	DES\	<a href="#">1088949R.DOC</a>	Completion Date Plus Working Days	E 09/30/85 R 01/01/07
	DES\	<a href="#">1088951R.DOC</a>	Incentive Payment Plan	E 10/01/95 R 01/01/07
	DES\	<a href="#">2080101.doc</a>	RAP For Non-Porous Embankment and Backfill	E 04/01/01 R 01/01/07
	DES\	<a href="#">4020211.doc</a>	Aggregate Surface Course for Temporary Access	E 04/01/01 R 01/02/07
	DES\	<a href="#">4408955R.DOC</a>	Pavement Removal, Special	E 01/13/89 R 01/01/07
	DES\	<a href="#">5028956R.DOC</a>	Rock Excavation for Structures, Special	E 09/30/85 R 01/01/07
	DES\	<a href="#">5038957R.DOC</a>	Rustication Finish For Retaining Walls	E 05/01/90 R 01/01/07
	DES\	<a href="#">5501234R.DOC</a>	Storm Sewer Adjacent to or Crossing Water Main	E 02/01/96 R 01/01/07
	DES\	<a href="#">5508960R.DOC</a>	Storm Sewers & Sewer Connections to City of Chicago Sewers	E 09/30/85 R 01/01/07
	DES\	<a href="#">6008961R.DOC</a>	Slotted Drain	E 09/30/85 R 01/01/07
	DES\	<a href="#">6028962R.DOC</a>	Cleaning Existing Drainage Structures	E 09/30/85 R 12/01/11
	DES\	<a href="#">6068964R.DOC</a>	Concrete Curb, Type B (Modified)	E 09/30/85 R 01/01/07
	DES\	<a href="#">6068965R.DOC</a>	Stabilized Median Surface	E 09/30/85 R 03/02/17
	DES\	<a href="#">6370499.doc</a>	Aggregate For Concrete Barrier (D-1)	E 03/11/04 R 01/24/08
	DES\	<a href="#">7016789.DOC</a>	Traffic Control & Protection (Arterials)	E 02/01/96 R 03/01/11
	DES\	<a href="#">9018967R.DOC</a>	Traffic Control Plan	E 09/30/85 R 01/01/07
	DES\	<a href="#">Adjustments-Reconstructs.doc</a>	Adjustments and Reconstructions	E 03/15/11
x	DES\	<a href="#">AGG SUBGR IMPROVEMENT(D1).doc</a>	Aggregate Subgrade Improvement (D1)	E 02/22/12 R 04/01/16
	DES\	<a href="#">Bit Coated Agg Slopewall.doc</a>	Bituminous Coated Aggregate Slopewall	E 01/01/07
x	DES\	<a href="#">CA Backfill Trench Backfill Bedding (D1).doc</a>	Coarse Aggregate for Backfill, Trench Backfill and Bedding (D-1)	E 11/01/11 R 11/01/13
	DES\	<a href="#">CAC-BMPR.doc</a>	Calcium Aluminate Cement (BMPR)	E 07/01/13
	DES\	<a href="#">Conc Noise Abate Wall(D1).docx</a>	Concrete Noise Abatement Walls (Absorptive & Reflective)(Dist 1)	E 09/05/08 R 01/12/11
	DES\	<a href="#">Construction Layout Special For Resurfacing With ADA and Stand Alone ADA (D-1).docx</a>	Construction Layout Special for resurfacing with ADA and Stand Alone ADA (D1)	E 01/01/17 R 04/17/17
	DES\	<a href="#">CTA Flag Coordination.doc</a>	CTA Flagging and Coordination	E 05/14/98 R 08/27/09
	DES\	<a href="#">Drain Inlet Prot Undr Traff(D1).doc</a>	Drainage And Inlet Protection Under Traffic (D-1)	E 04/01/11 R 04/02/11
	DES\	<a href="#">Embankment I.doc</a>	Embankment I	E 03/01/11 R 11/01/13
	DES\	<a href="#">Embankment II.doc</a>	Embankment II	E 03/01/11 R 11/01/13
	DES\	<a href="#">ENG FIELD OFF TY A (SP).doc</a>	Engineer's Field Office Type A (Special)	E 12/01/11 R 05/01/13
	DES\	<a href="#">Friction Agg(D-1).doc</a>	Friction Aggregate (D-1)	E 01/01/11 R 04/26/16
	DES\	<a href="#">Grade Shape Shldr.doc</a>	Grading and Shaping Shoulders	E 12/28/01 R 01/01/07
	DES\	<a href="#">GTR Modified Binder(D-1).doc</a>	Ground Tire Rubber (GTR) Modified Asphalt Binder (D-1)	E 06/29/06 R 04/01/16
	DES\	<a href="#">HMA Mix Des Reqmts(D-1).doc</a>	HMA Mixture Design Requirements (D-1)	E 01/01/13 R 04/01/16
	DES\	<a href="#">Hot in Place Recycle.doc</a>	Pavement Rehabilitation by Hot In-Place Recycling	E 07/11/03 R 05/05/14
	DES\	<a href="#">LightwtCellularConcFill(D1).docx</a>	Lightweight Cellular Concrete Fill (D-1)	E 11/11/01 R 02/01/16
	DES\	<a href="#">Pub Conv Sfty(D1).doc</a>	Public Convenience and Safety (D-1)	E 05/01/12 R 07/15/12
x	DES\	<a href="#">RAP-RAS(D1).doc</a>	Reclaimed Asphalt Pavement (RAP) and Reclaimed Asphalt Shingles (RAS) (D-1)	E 11/01/12 R 04/01/17
	DES\	<a href="#">Slipform Paving (D-1).doc</a>	Slipform Paving (D-1)	E 11/01/14
	DES\	<a href="#">Status Utility (D-1).doc</a>	Status Of Utilities (D-1)	E 06/01/2016

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DES\	<a href="#">TEMP_PVMT.doc</a>	Temporary Pavement	E 03/01/03 R 04/10/08
DES\	<a href="#">WINTERIZED TEMP ACCESS 3-5-12.doc</a>	Winterized Temporary Access	E 01/01/12 R 03/05/12

### Bureau of Electrical Special Provisions

ELE\	<a href="#">810.02-UNDERGROUND RACEWAYS.doc</a>	Underground Raceways	E 3/1/2015
ELE\	<a href="#">Combination Controller 2015.doc</a>	Combination Lighting Controller	E 2/23/2015
ELE\	<a href="#">Elec Serv Disc lgt sig 2012.doc</a>	Electric Service Disconnect, Lighting And Traffic Signal	E: 1/1/2012
ELE\	<a href="#">Fiber Optic Cable SM 2013 v2.doc</a>	Fiber Optic Cable	E 3/15/2013
ELE\	<a href="#">Fiber Optic Cable Splice 2014 v1.doc</a>	Fiber Optic Cable	E 6/1/2014
ELE\	<a href="#">General Electrical Provisions 2016 V1.doc</a>	General Electrical Requirements GPS	E 4/1/2016
ELE\	<a href="#">General Electrical Provisions 2016 V3.doc</a>	General Electrical Requirements GPS	E 6/1/2016
ELE\	<a href="#">HPS Underpass 2012.doc</a>	Underpass Luminaire, Hps, Stainless Steel Housing	E 1/1/2012
ELE\	<a href="#">Innerduct v4 2014.doc</a>	Wire and Cable	E 10/1/2014
ELE\	<a href="#">Junction Box Embedded 2012.doc</a>	Junction Box Embedded in Structure	E 1/1/2012
ELE\	<a href="#">Light Tower 2016 Galvanized AASHTO exception v2.doc</a>	LIGHT TOWER	E 4/1/2016
ELE\	<a href="#">Lighting Controller SCADA 2012.doc</a>	Lighting Controller, Radio Control, Duplex, Console Type	E 1/1/2012
ELE\	<a href="#">Lighting Maint 2017.doc</a>	Maintenance of Lighting Systems	E 3/1/2017
ELE\	<a href="#">Luminaire 2012.doc</a>	Luminaire	E 1/1/2012
ELE\	<a href="#">Luminaire LED 2016 v2.docx</a>	Luminaire, LED	E 2/1/16
ELE\	<a href="#">Luminaire safety cable 2012.DOC</a>	Luminaire Safety Cable Assembly	E 1/1/2012
ELE\	<a href="#">Protect Underpass LightingSystem 2012.doc</a>	Protect & Maintain Underpass Luminaires	E 1/1/2012
ELE\	<a href="#">Raceway Exposed 2012.DOC</a>	Exposed Raceways	E 1/1/2012
ELE\	<a href="#">Service Connection 2012.doc</a>	Electric Utility Service Connection (ComEd)	E 1/1/2012
ELE\	<a href="#">Service Install 2012.doc</a>	Electric Service Installation	E 1/1/2012
ELE\	<a href="#">Temp light SingleLaneStg 2012.doc</a>	Temporary Lighting For Single Lane Staging	E 01/01/2012
ELE\	<a href="#">Temp pole install 2012.DOC</a>	Temporary Wood Pole, Install Only	E 1/1/2012
ELE\	<a href="#">Unit Duct 2012.DOC</a>	Unit Duct	E 1/01/2012
ELE\	<a href="#">Wire Cable 2012.doc</a>	Wire and Cable	E 1/1/2012

### Guide Bridge Special Provisions

GBS\	<a href="#">gbsp04.doc</a>	Polymer Modified Portland Cement Mortar	E 6/7/94 R 04/01/16
GBS\	<a href="#">gbsp12.doc</a>	Drainage System	E 6/10/94 R 6/24/15
GBS\	<a href="#">gbsp13.doc</a>	High Load Multi-Rotational Bearings	E 10/13/88 R 04/01/16
GBS\	<a href="#">gbsp14.doc</a>	Jack and Remove Existing Bearings	E 4/20/94 R 01/01/07
GBS\	<a href="#">gbsp15.doc</a>	Three Sided Precast Concrete Structure	E 7/12/94 R 12/21/16
GBS\	<a href="#">gbsp16.doc</a>	Jacking Existing Superstructure	E 1/11/93 R 01/01/07
GBS\	<a href="#">gbsp17.doc</a>	Bonded Preformed Joint Seal	E 7/12/94 R 04/01/16
GBS\	<a href="#">gbsp18.doc</a>	Modular Expansion Joint	E 5/19/94 R 12/29/14
GBS\	<a href="#">gbsp21.doc</a>	Cleaning and Painting Contact Surfaces of Existing Steel Structures	E 5/15/91 R 05/18/11
GBS\	<a href="#">GBSP25.doc</a>	Cleaning and Painting Existing Steel Structures	E 10/02/01 R 04/22/16
GBS\	<a href="#">GBSP26.doc</a>	Containment and Disposal of Lead Paint Cleaning Residues	E 10/02/01 R 04/22/16
GBS\	<a href="#">gbsp28.doc</a>	Deck Slab Repair	E 5/15/95 R 1/18/11
GBS\	<a href="#">gbsp29.doc</a>	Bridge Deck Microsilica Concrete Overlay	E 5/15/95 R 04/01/16
GBS\	<a href="#">gbsp30.doc</a>	Bridge Deck Latex Concrete Overlay	E 5/15/95 R 6/24/15

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GBS\	<a href="#">gbsp31.doc</a>	Bridge Deck HRM Concrete Overlay	E 1/21/00 R 04/01/16
GBS\	<a href="#">gbsp33.doc</a>	Pedestrian Truss Superstructure	E 1/13/98 R 12/29/14
GBS\	<a href="#">GBSP34.doc</a>	Concrete Wearing Surface	E 6/23/94 R 04/01/16
GBS\	<a href="#">GBSP35.doc</a>	Silicone Bridge Joint Sealer	E 8/1/95 R 10/15/11
GBS\	<a href="#">GBSP45.doc</a>	Bridge Deck Thin Polymer Overlay	E 05/07/97 R 02/06/13
GBS\	<a href="#">GBSP51.doc</a>	Pipe Underdrains for Structures	E 5/17/00 R 01/22/10
GBS\	<a href="#">GBSP53.doc</a>	Structural Repair of Concrete	E 03/15/06 R 04/01/16
GBS\	<a href="#">GBSP55.doc</a>	Erection of Curved Steel Structures	E 06/01/07 R
GBS\	<a href="#">GBSP56.doc</a>	Setting Piles In Rock	E 11/14/96 R 04/01/16
GBS\	<a href="#">GBSP59.docx</a>	Diamond Grinding and Surface Testing Bridge Sections	E 12/6/04 R 12/21/16
GBS\	<a href="#">GBSP60.doc</a>	Containment and Disposal of Non Lead Paint Cleaning Residues	E 11/25/04 R 04/22/16
GBS\	<a href="#">GBSP61.doc</a>	Slipform Parapet	E 06/01/07 R 04/22/16
GBS\	<a href="#">gbsp67.doc</a>	Structural Assessment Reports for Contractor's Means and Methods	E 03/06/09 R 10/05/15
GBS\	<a href="#">GBSP71.doc</a>	Aggregate Column Ground Improvement	E 01/15/09 R 10/15/11
GBS\	<a href="#">GBSP72.doc</a>	Bridge Deck Fly Ash or Ground Granulated Blast-Furnace Concrete Overlay	E 1/18/11 R 6/24/15
GBS\	<a href="#">GBSP75.doc</a>	Bond Breaker for Prestressed Concrete Bulb-T Beams	E 04/19/12 R
GBS\	<a href="#">GBSP77.doc</a>	Weep Hole Drains for Abutments, Wingwalls, Retaining Walls and Culverts	E 04/19/12 R 10/22/13
GBS\	<a href="#">GBSP78.doc</a>	Bridge Deck Construction	E 10/22/13 R 12/21/16
GBS\	<a href="#">GBSP79.doc</a>	Bridge Deck Grooving (Longitudinal)	E 12/29/14 R 4/1/16
GBS\	<a href="#">GBSP81.docx</a>	Membrane Waterproofing for buried Structures	E 10/04/16 R
GBS\	<a href="#">GBSP82.docx</a>	Metallizing of Structural Steel	E 10/4/16 R
GBS\	<a href="#">GBSP83.docx</a>	Hot Dip Galvanizing for Structural Steel	E 6/22/99 R 6/24/15
GBS\	<a href="#">GBSP85.doc</a>	Micropiles	E 04/19/96 R 10/5/15
GBS\	<a href="#">GBSP86.doc</a>	Drilled Shafts	E 10/05/15 R 04/01/16
GBS\	<a href="#">GBSP87.doc</a>	Lightweight Cellular Concrete Fill	E 11/11/01 R 04/01/16
GBS\	<a href="#">GBSP88.doc</a>	Corrugated Structural Plate Structures	E 4/22/16 R
GBS\	<a href="#">GBSP89.docx</a>	Preformed Pavement Joint Seal	E 10/4/16 R
GBS\	<a href="#">gbsp90.doc</a>	Three Sided Precast Concrete Structure	E 12/21/16 R
GBS\	<a href="#">GBSP91.docx</a>	Crosshole Sonic Logging Testing of Drilled Shafts	E 12/21/16 R
GBS\	<a href="#">GBSP92.docx</a>	Thermal Integrity Testing of Drilled Shafts	E 04/20/16 R
GBS\	<a href="#">GBSP93.docx</a>	Preformed Bridge Joint Seal	E 12/21/16 R
GBS\	<a href="#">GBSP94.doc</a>	Warranty for Cleaning and Painting Steel Structures	E 3/3/00 R 11/24/04
GBS\	<a href="#">GBSP95.docx</a>	Bridge Deck Concrete Sealer	E 06/17/10 R 12/21/16
GBS\	<a href="#">index.doc</a>	GBSP Check Sheet	

### **Bridge and Roadway Maintenance Special Provisions**

MNT1\	<a href="#">ADJRCK.doc</a>	Adjust Rocker and Sole Plate	E 01/23/95 R 01/01/07
MNT1\	<a href="#">APPR_SLAB_REM&amp;REPL.doc</a>	Approach Slab Removal & Replacement	E 12/28/01 R 08/01/15
MNT1\	<a href="#">APSLRP.DOC</a>	Approach Slab Repair	E 03/13/97 R 09/25/09
MNT1\	<a href="#">Bmstrt.doc</a>	Beam Straightening	E 12/06/94 R 01/01/07
MNT1\	<a href="#">Brgpad.doc</a>	Bearing Pad Adjustment	E 07/27/94 R 01/01/07
MNT1\	<a href="#">Bridge_Drain_Sys_Repair.doc</a>	Bridge Drainage System Repairs	E 11/16/10 R 09/15/11
MNT1\	<a href="#">BRR.doc</a>	Bridge Rail Removal	E 04/15/99 R 01/01/07
MNT1\	<a href="#">Cleaning Drainage System.doc</a>	Cleaning Drainage System	E 06/21/04 R 08/30/10
MNT1\	<a href="#">Conccscar.doc</a>	Concrete Bridge Deck Scarification [W/New Hma Overlay W/O Wms]	E 11/22/02 R 01/01/07
MNT1\	<a href="#">CWS.DOC</a>	Concrete Wearing Surface [Use on Slab Bridges - for PPC Dk Bms use GBSP34]	E 06/23/94 R 01/01/07
MNT1\	<a href="#">Debris Removal.doc</a>	Debris Removal	E 06/27/02
MNT1\	<a href="#">dowelrp.doc</a>	Dowel Repair	E 07/27/94 R 01/01/07
MNT1\	<a href="#">EPXINJ.DOC</a>	Epoxy Injection	E 12/06/94 R 01/01/07



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MNT1\	<a href="#">Fldrex.doc</a>	Floor Drain Extension	E 02/01/96 R 04/07/98
MNT1\	<a href="#">Grade_Shape_Foreslope.doc</a>	Grading And Shaping Foreslopes	E 04/01/08
MNT1\	<a href="#">Groutrp.doc</a>	Grout Repair	E 07/27/94 R 01/01/07
MNT1\	<a href="#">HMArm1.doc</a>	Hot-Mix Asphalt Surface Removal Complete	E 12/08/93 R 01/01/07
MNT1\	<a href="#">HMArm2.DOC</a>	Hot-Mix Asphalt Surface Removal [Use w/ PPC Deck Beams]	E 07/27/94 R 01/01/07
MNT1\	<a href="#">HMArm3.doc</a>	Hot-Mix Asphalt Surface Removal (Deck)	E 04/29/96 R 01/01/07
MNT1\	<a href="#">HMArm4.doc</a>	Hot-Mix Asphalt Surface Removal [Use w/Deck Slab Repairs]	E 07/27/94 R 01/01/07
MNT1\	<a href="#">Jckcrb.doc</a>	Jacking and Cribbing	E 10/05/99 R 01/01/07
MNT1\	<a href="#">JKRPBR.DOC</a>	Jack and Reposition Bearings	E 12/15/93 R 07/15/96
MNT1\	<a href="#">Keep Toll Open To Traffic.doc</a>	Keeping the Tollway Open to Traffic	E 03/22/96 R 10/12/10
MNT1\	<a href="#">Keywyrp.doc</a>	Keyway Repair	E 07/27/94 R 08/12/11
MNT1\	<a href="#">NIGHT_WZ_LIGHT(D1).doc</a>	Nighttime Work Zone Lighting (D1)	E 11/01/08 R 06/15/10
MNT1\	<a href="#">PINLNK.DOC</a>	Pin and Link Replacement	E 11/20/95 R 06/20/96
MNT1\	<a href="#">PINRR.DOC</a>	Pin Replacement	E 06/11/96 R 06/20/96
MNT1\	<a href="#">plexdd.doc</a>	Plug Existing Deck Drains	E 11/06/96 R 01/01/07
MNT1\	<a href="#">PPROSH.DOC</a>	Permanent Protective Shield System	E 10/03/96 R 06/27/08
MNT1\	<a href="#">PrGrAng.doc</a>	Pressure Grouting Angles	E 06/01/93 R 01/01/07
MNT1\	<a href="#">reancr.doc</a>	Re-Anchor Existing Expansion Joint Angles	E 02/20/98
MNT1\	<a href="#">REBAR.DOC</a>	Cleaning and Painting Exposed Rebar	E 03/20/97 R 01/01/07
MNT1\	<a href="#">RECIBm.doc</a>	Removal of Existing Concrete I-Beam	E 07/09/98 R 05/05/99
MNT1\	<a href="#">REXPPCDB.doc</a>	Removal of Existing Precast Prestressed Concrete Deck Beams	E 10/28/98 R 01/01/07
MNT1\	<a href="#">RREXRL.DOC</a>	Removing and Re-Erecting Existing Railing	E 10/31/96 R 01/01/07
MNT1\	<a href="#">Scarify.doc</a>	Concrete Bridge Deck Scarification	E 05/15/95 R 01/01/07
MNT1\	<a href="#">SteelRem.doc</a>	Structural Steel Removal	E 10/03/97 R 01/01/07
MNT1\	<a href="#">steelrep.doc</a>	Structural Steel Repair	E 12/15/00 R 01/01/07
MNT1\	<a href="#">STRBM.DOC</a>	Straighten Bent Members	E 01/23/97 R 06/19/06
MNT1\	<a href="#">StructRepConcr(SP).doc</a>	Structural Repair Of Concrete (Special)	E 04/02/07
MNT1\	<a href="#">Tmpsh1.doc</a>	Temporary Shoring & Cribbing [when req'd for damaged beam replacement; requires SE]	E 06/16/92 R 03/11/03
MNT1\	<a href="#">Tmpsh1a.doc</a>	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\	<a href="#">Tmpsh2.doc</a>	Temporary Shoring and Cribbing [for use w/longitudinal joint. closure on slab bridges]	E 07/27/94 R 03/11/03
MNT1\	<a href="#">TMPSH3.DOC</a>	Temporary Shoring and Cribbing [Use during Pile Repair]	E 07/16/92 R 03/11/03
MNT1\	<a href="#">TMPSH4.DOC</a>	Temporary Shoring and Cribbing [Use to support Beams over substructure repair]	E 7/16/92 R 10/17/11
MNT1\	<a href="#">TMPSH5.DOC</a>	Temporary Shoring and Cribbing [Support Slab Bridge during Joint reconstruction]	E 07/16/92 R 03/11/03
MNT1\	<a href="#">TMPSH6.DOC</a>	Temporary Shoring and Cribbing [support effected beam during beam end repairs]	E 10/22/04 R 11/09/04
MNT1\	<a href="#">TMPSLB.DOC</a>	Temporary Slab Support System [use with beam replacement]	E 07/27/94 R 03/11/03
MNT1\	<a href="#">TMPSP1.DOC</a>	Temporary Support System [Use for Pin & Link Replacement]	E 11/20/95 R 04/04/97
MNT1\	<a href="#">TMPSP2.DOC</a>	Temporary Support System [Use if Pins over RR]	E 11/20/95 R 03/11/03
MNT1\	<a href="#">Work_Zone_Traff_Ctrl(D1-M).doc</a>	Work Zone Traffic Control (D-1 Maintenance)	E 05/30/96 R 06/15/10
MNT2\	<a href="#">COARSE SAND PLACEMENT.doc</a>	Coarse Sand Placement	E 02/07/07
MNT2\	<a href="#">GENERAL REQUIREMENTS</a>	General Requirements For Weed Control Spraying	E 02/07/07

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		<a href="#">FOR WEED CONTROL SPRAYING.doc</a>		
	MNT2\	<a href="#">MULCH PLACEMENT FOR WOODY PLANTS.doc</a>	Mulch Placement For Woody Plants	E 02/07/07
	MNT2\	<a href="#">Pruning-safety.doc</a>	Pruning For Safety And Equipment Clearance	E 10/31/06
	MNT2\	<a href="#">SELECTIVE CLEARING.doc</a>	Selective Clearing	E 02/08/07
	MNT2\	<a href="#">WEED CONTROL PRE-EMERGENT GRANULAR HERBICIDE.doc</a>	Weed Control, Pre-Emergent Granular Herbicide	E 07/29/02 R 02/07/07
	MNT2\	<a href="#">WEED CONTROL, NON-SELECTIVE AND NON-RESIDUAL.doc</a>	Weed Control, Non-Selective And Non-Residual	E 02/07/07
	MNT2\	<a href="#">WEED CONTROL, TEASEL (POUND).doc</a>	Weed Control, Teasel (Pound)	E 02/07/07

### Bureau of Traffic Special Provisions

	TRF\	<a href="#">701.01T-KEEPING THE EXPRESSWEAY OPEN TO TRAFFIC.doc</a>	Keeping The Expressway Open To Traffic	E 03/22/96 R 01/21/15
	TRF\	<a href="#">701.02T-FAILURE TO OPEN TRAFFIC LANES TO TRAFFIC.docx</a>	Failure To Open Traffic Lanes To Traffic	E 03/22/96 R 02/09/05
	TRF\	<a href="#">701.03T-TRAFFIC CONTROL AND PROTECTION (EXPRESSWAYS).doc</a>	Traffic Control And Protection (Expressways)	E 03/08/96 R 03/01/17
	TRF\	<a href="#">701.04T-TRAFFIC CONTROL SURVIELLANCE (EXPRESSWAYS).doc</a>	Traffic Control Surveillance (Expressways)	E 10/25/95 R 01/21/15
	TRF\	<a href="#">701.06T-TEMPORARY INFORMATION SIGNING.docx</a>	Temporary Information Signing	E 11/13/96 R 01/02/07
	TRF\	<a href="#">701.07T-TRAFFIC CONTROL FOR WORK ZONE AREAS.docx</a>	Traffic Control For Work Zone Areas	E 09/14/95 R 01/01/07
	TRF\	<a href="#">701.08Ta-KEEPING ARTERIAL ROADWAYS OPEN TO TRAFFIC (LANE CLOSURES ONLY).docx</a>	Keeping Arterial Roadways Open To Traffic (Lane Closures Only)	E 01/22/03 R 02/20/15
	TRF\	<a href="#">701.08Tb-KEEPING ARTERIAL ROADWAYS OPEN TO TRAFFIC (WITH 15 MIN FULL STOPS).docx</a>	Keeping Arterial Roadways Open To Traffic (With 15 MIN Full Stops)	E 01/22/03 R 02/20/15
	TRF\	<a href="#">701.15T-SPEED DISPLAY TRAILER (D1).docx</a>	Speed Display Trailer (D1)	E 4/01/15; R 1/1/17
	TRF\	<a href="#">720.01TS-MAST ARM SIGN PANELS.docx</a>	Mast Arm Sign Panels	E 05/22/02 R 07/01/15
	TRF\	<a href="#">720.02TS-SIGN SHOP DRAWING SUBMITTAL.docx</a>	Sign Shop Drawing Submittal	E 01/22/13 R 07/01/15
	TRF\	<a href="#">733.09T-OVERHEAD SIGN STRUCTURE BRIDGE MOUNTED.docx</a>	Overhead Sign Structure - Bridge Mounted	E 07/01/15 R 3/1/2017
	TRF\	<a href="#">780.01T-45 MIL HOT SPRAY THERMOPLASTIC PAVEMENT MARKING.docx</a>	45 Mil Hot Spray Thermoplastic Pavement Marking	E 02/28/94 R 12/18/12
	TRF\	<a href="#">800.01TS-TRAFFIC SIGNAL GENERAL REQUIREMENTS.docx</a>	Traffic Signal General Requirements	E 05/22/02 R 03/25/16
	TRF\	<a href="#">800.02TS-OPTIMIZE TRAFFIC SIGNAL SYSTEM.docx</a>	Optimize Traffic Signal System	E 05/22/02 R 07/01/15
	TRF\	<a href="#">800.03TS-RE-OPTIMIZE TRAFFIC SIGNAL SYSTEM.docx</a>	Re-Optimize Traffic Signal System	E 05/22/02 R 07/01/15
	TRF\	<a href="#">805.01TS-SERVICE INSTALLATION (TRAFFIC SIGNALS).docx</a>	Service Installation (Traffic Signals)	E 05/22/02 R 06/15/16
	TRF\	<a href="#">806.01TS-GROUNDING OF TRAFFIC SIGNAL SYSTEMS.docx</a>	Grounding Of Traffic Signal Systems	E 05/22/02 R 07/01/15

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TRF\	<a href="#">810.01TS-COILABLE NON-METALLIC CONDUIT.docx</a>	Coilable Non-Metallic Conduit	E 05/22/02 R 07/01/15
TRF\	<a href="#">810.02TS-UNDERGROUND RACEWAYS.docx</a>	Underground Raceways	E 05/22/02 R 07/01/15
TRF\	<a href="#">810.03TS-ROD AND CLEAN EXISTING CONDUIT.docx</a>	Rod And Clean Existing Conduit	E 01/01/15 R 07/01/15
TRF\	<a href="#">814.01TS-HANDHOLES.docx</a>	Handholes	E 01/01/02 R 07/01/15
TRF\	<a href="#">817.01TS-GROUNDING CABLE.docx</a>	Grounding Cable	E 05/22/02 R 07/01/15
TRF\	<a href="#">817.02TS-FIBER OPTIC TRACER CABLE.docx</a>	Fiber Optic Tracer Cable	E 05/22/02 R 07/01/15
TRF\	<a href="#">850.01TS-MAINTENANCE OF EXISTING TRAFFIC SIGNAL AND FLASHING BEACON INSTALLATION.docx</a>	Maintenance Of Existing Traffic Signal Installation	E 05/22/02 R 07/01/15
TRF\	<a href="#">851.01TS-TRAFFIC SIGNAL PAINTING.docx</a>	Traffic Signal Painting	E 05/22/02 R 07/01/15
TRF\	<a href="#">857.01TS-FULL-ACTUATED CONTROLLER (SPECIAL).docx</a>	Full-Actuated Controller (Special)	E 09/26/95 R 07/01/15
TRF\	<a href="#">857.02TS-FULL-ACTUATED CONTROLLER AND CABINET.docx</a>	Full-Actuated Controller And Cabinet	E 01/01/02 R 07/01/15
TRF\	<a href="#">857.03TS-RAILROAD, FULL-ACTUATED CONTROLLER AND CABINET.docx</a>	Railroad, Full-Actuated Controller And Cabinet	E 01/01/02 R 07/01/15
TRF\	<a href="#">860.01TS-MASTER CONTROLLER.docx</a>	Master Controller	E 05/22/02 R 07/01/15
TRF\	<a href="#">862.01TS-UNINTERRUPTABLE POWER SUPPLY, SPECIAL.docx</a>	Uninterruptable Power Supply, Special	E 01/01/13 R 05/19/16
TRF\	<a href="#">862.02TS-UNINTERRUPTABLE POWER SUPPLY, GROUND MOUNTED.docx</a>	Uninterruptable Power Supply, Ground Mounted	E 01/01/12 R 07/01/15
TRF\	<a href="#">871.01TS-FIBER OPTIC CABLE.docx</a>	Fiber Optic Cable	E 05/22/02 R 07/01/15
TRF\	<a href="#">873.01TS-ELECTRIC CABLE.docx</a>	Electric Cable	E 05/22/02 R 07/01/15
TRF\	<a href="#">873.02TS-GROUNDING EXISTING HANDHOLE FRAME AND COVER.docx</a>	Grounding Existing Handhole Frame And Cover	E 05/22/02 R 07/01/15
TRF\	<a href="#">873.03TS-EVP SYSTEM LINE SENSOR CABLE, NO. 20 3C.docx</a>	Emergency Vehicle Priority System Line Sensor Cable, No. 20 3/C	E 01/01/13 R 07/01/15
TRF\	<a href="#">873.04TS-RAILROAD INTERCONNECT CABLE.docx</a>	Railroad Interconnect Cable	E 05/22/02 R 07/01/15
TRF\	<a href="#">875.01TS-TRAFFIC SIGNAL POST.docx</a>	Traffic Signal Post	E 05/22/02 R 07/01/15
TRF\	<a href="#">876.01TS-PEDESTRIAN PUSH-BUTTON POST.docx</a>	Pedestrian Push-Button Post	E 05/22/02 R 07/01/15
TRF\	<a href="#">877.01TS-MAST ARM ASSEMBLY AND POLE.docx</a>	Mast Arm Assembly And Pole	E 05/22/02 R 07/01/15
TRF\	<a href="#">878.01TS-CONCRETE FOUNDATIONS.docx</a>	Concrete Foundations	E 05/22/02 R 07/01/15
TRF\	<a href="#">878.02TS-REMOVE AND REPLACE ANCHOR BOLTS.docx</a>	Remove And Replace Anchor Bolts	E 01/01/14 R 07/01/15
TRF\	<a href="#">880.01TS-LED SIGNAL HEAD AND OPTICALLY PROGRAMMED LED SIGNAL HEAD.docx</a>	Light Emitting Diode (Led) Signal Head And Optically Programmed Led Signal Head	E 05/22/02 R 07/01/15
TRF\	<a href="#">880.02TS-FLASHING BEACON INSTALLATION, RELOCATION AND REMOVAL.docx</a>	Flashing Beacon Installation, Relocation And Removal	E 01/01/07 R 07/01/15
TRF\	<a href="#">881.01TS-LED PEDESTRIAN SIGNAL HEAD.docx</a>	Light Emitting Diode (Led) Pedestrian Signal Head	E 05/22/02 R 07/01/15
TRF\	<a href="#">882.01TS-TRAFFIC SIGNAL BACKPLATE.docx</a>	Traffic Signal Backplate	E 05/22/02 R 07/01/15
TRF\	<a href="#">886.01TS-DETECTOR LOOP.docx</a>	Detector Loop	E 05/22/02 R 01/05/16
TRF\	<a href="#">886.02TS-DETECTOR LOOP REPLACEMENT AND OR INSTALLATION.docx</a>	Detector Loop Replacement And/Or Installation (Roadway Grinding, Resurfacing, & Patching Operations)	E 01/01/85 R 01/05/16
TRF\	<a href="#">886.03TS-RADAR VEHICLE DETECTION SYSTEM.docx</a>	Radar Vehicle Detection System	E 07/01/15 R

# SPECIAL PROVISIONS CHECK LIST

## Generated - 4/24/17 Revised – 5/1/17

**Designer:**  
**Contract No.:**

**C-880036-04**

**FAP:**  
**Section:**  
**County:**

**1405**  
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**Cook**

TRF\	<a href="#">887.01TS-EMERGENCY VEHICLE PRIORITY SYSTEM.docx</a>	Emergency Vehicle Priority System	E 05/22/02 R 07/01/15
TRF\	<a href="#">887.02TS-RELOCATE EXISTING EVP SYSTEM, DETECTOR UNIT.docx</a>	Relocate Existing Emergency Vehicle Priority System, Detector Unit	E 01/01/02 R 07/01/15
TRF\	<a href="#">887.03TS-RELOCATE EXISTING EVP SYSTEM, PHASING UNIT.docx</a>	Relocate Existing Emergency Vehicle Priority System, Phasing Unit	E 01/01/02 R 07/01/15
TRF\	<a href="#">887.04TS-CONFIRMATION BEACON.docx</a>	Confirmation Beacon	E 01/01/02 R 07/01/15
TRF\	<a href="#">888.01TS-PEDESTRIAN PUSH-BUTTON.docx</a>	Pedestrian Push-Button	E 05/22/02 R 07/01/15
TRF\	<a href="#">888.02TS-ACCESSIBLE PEDESTRIAN SIGNALS.docx</a>	Accessible Pedestrian Signals	E 04/01/03 R 07/01/15
TRF\	<a href="#">890.01TS-TEMPORARY TRAFFIC SIGNAL INSTALLATION.docx</a>	Temporary Traffic Signal Installation	E 05/22/02 R 01/01/17
TRF\	<a href="#">890.02TS-TEMPORARY TRAFFIC SIGNAL TIMING.docx</a>	Temporary Traffic Signal Timing	E 05/22/02 R 07/01/15
TRF\	<a href="#">891.01TS-ILLUMINATED SIGN, LED.docx</a>	Illuminated Sign, Led	E 05/22/02 R 07/01/15
TRF\	<a href="#">891.02TS-LED INTERNALLY ILLUMINATED STREET NAME SIGN.docx</a>	LED Internally Illuminated Street Name Sign	E 05/22/02 R 07/01/15
TRF\	<a href="#">895.01TS-MODIFY EXISTING CONTROLLER CABINET.docx</a>	Modify Existing Controller Cabinet	E 05/22/02 R 07/01/15
TRF\	<a href="#">895.02TS-REMOVE EXISTING TRAFFIC SIGNAL EQUIPMENT.docx</a>	Remove Existing Traffic Signal Equipment	E 05/22/02 R 07/01/15
TRF\	<a href="#">895.03TS-MODIFY EXISTING TYPE D FOUNDATION.docx</a>	Modify Existing Type "D" Foundation	E 01/01/02 R 07/01/15
TRF\	<a href="#">895.04TS-REBUILD EXISTING HANDHOLE.docx</a>	Rebuild Existing Handhole	E 01/01/02 R 07/01/15
TRF\	<a href="#">895.05TS-REBUILD EXISTING HANDHOLE TO HEAVY-DUTY HANDHOLE.docx</a>	Rebuild Existing Handhole To Heavy-Duty Handhole	E 01/01/02 R 07/01/15

**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 AGENCY 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\	<a href="#">20338.doc</a>	TRAINING SPECIAL PROVISIONS	E 10/15/75
ZD&E\	<a href="#">3426I.doc</a>	RAILROAD PROTECTIVE LIABILITY INSURANCE	E 12/01/86 R 01/01/06
ZD&E\	<a href="#">5026I.doc</a>	BUILDING REMOVAL - CASE I (NON-FRIABLE AND FRIABLE ASBESTOS ABATEMENT)	E 09/01/90 R 04/01/10
ZD&E\	<a href="#">5048I.doc</a>	BUILDING REMOVAL - CASE II (NON-FRIABLE ASBESTOS ABATEMENT)	E 09/01/90 R 04/01/10
ZD&E\	<a href="#">5049I.doc</a>	BUILDING REMOVAL - CASE III (FRIABLE ASBESTOS ABATEMENT)	E 09/01/90 R 04/01/10
ZD&E\	<a href="#">5053I.doc</a>	BUILDING REMOVAL - CASE IV (NO ASBESTOS)	E 09/01/90 R 04/01/10
ZD&E\	<a href="#">80029.doc</a>	DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION	E 09/01/00 R 07/2/16
ZD&E\	<a href="#">80045.doc</a>	MATERIAL TRANSFER DEVICE	E 06/15/99 R 08/01/14
ZD&E\	<a href="#">80071.doc</a>	WORKING DAYS	E 01/01/02
ZD&E\	<a href="#">80099.doc</a>	ACCESSIBLE PEDESTRIAN SIGNALS (APS)	E 04/01/03 R 01/01/14
ZD&E\	<a href="#">80127.doc</a>	STEEL COST ADJUSTMENT	E 04/02/04 R 08/01/17
ZD&E\	<a href="#">80157.doc</a>	RAILROAD PROTECTIVE LIABILITY INSURANCE (5 and 10)	E 01/01/06
ZD&E\	<a href="#">80165.doc</a>	MOISTURE CURED URETHANE PAINT SYSTEM	E 11/01/06 R 01/01/10
ZD&E\	<a href="#">80173.doc</a>	BITUMINOUS MATERIALS COST ADJUSTMENTS	E 11/2/06 R 08/01/17
ZD&E\	<a href="#">80192.doc</a>	AUTOMATED FLAGGER ASSISTANCE DEVICES	E 01/01/08
ZD&E\	<a href="#">80198.doc</a>	COMPLETION DATE (VIA CALENDAR DAYS)	E 04/01/08
ZD&E\	<a href="#">80199.doc</a>	COMPLETION DATE (VIA CALENDAR DAYS) PLUS WORKING DAYS	E 04/01/08

# SPECIAL PROVISIONS CHECK LIST

## Generated - 4/24/17 Revised – 5/1/17

**Designer:**  
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**C-880036-04**

**FAP:**  
**Section:**  
**County:**

**1405**  
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**Cook**

ZD&E\	<a href="#">80229.doc</a>	FUEL COST ADJUSTMENT	E 04/01/09 R 08/01/17
ZD&E\	<a href="#">80241.doc</a>	BRIDGE DEMOLITION DEBRIS	E 07/01/09
ZD&E\	<a href="#">80246.doc</a>	HOT-MIX ASPHALT - DENSITY TESTING OF LONGITUDINAL JOINTS	E 01/01/10 R 04/01/2016
ZD&E\	<a href="#">80261.doc</a>	CONSTRUCTION AIR QUALITY-DIESEL RETROFIT	E 06/01/10 R 11/01/14
ZD&E\	<a href="#">80274.doc</a>	AGGREGATE SUBGRADE IMPROVEMENT	E 04/01/12 R 04/01/16
ZD&E\	<a href="#">80277.doc</a>	CONCRETE MIX DESIGN - DEPARTMENT PROVIDED	E 01/01/12 R 04/01/16
ZD&E\	<a href="#">80288.doc</a>	WARM MIX ASPHALT	E 01/01/12 R 04/01/16
ZD&E\	<a href="#">80293.doc</a>	CONCRETE BOX CULVERTS WITH SKEWS > 30 DEGREES AND DESIGN FILLS < 5 FEET	E 04/01/12 R 07/01/16
ZD&E\	<a href="#">80298.doc</a>	TEMPORARY PAVEMENT MARKING	E 04/01/16 R 04/01/17
ZD&E\	<a href="#">80300.doc</a>	PREFORMED PLASTIC PAVEMENT MARKING TYPE D - INLAID	E 04/01/12 R 04/01/16
ZD&E\	<a href="#">80302.doc</a>	WEEKLY DBE TRUCKING REPORTS	E 06/02/12 R 04/02/15
ZD&E\	<a href="#">80304.doc</a>	GROOVING FOR RECESSED PAVEMENT MARKINGS	E 11/01/12 R 08/01/14
ZD&E\	<a href="#">80306.doc</a>	RECLAIMED ASPHALT PAVEMENT AND RECLAIMED ASPHALT SHINGLES	E 11/01/12 R 04/01/16
ZD&E\	<a href="#">80311.doc</a>	CONCRETE END SECTIONS FOR PIPE CULVERTS	E 01/01/13 R 04/01/16
ZD&E\	<a href="#">80317.doc</a>	SURFACE TESTING OF HOT-MIX ASPHALT OVERLAYS	E 01/01/13 R 04/01/16
ZD&E\	<a href="#">80318.doc</a>	TRAVERSABLE PIPE GRATE	E 01/01/13 R 04/01/14
ZD&E\	<a href="#">80328.doc</a>	PROGRESS PAYMENTS	E 11/02/13
ZD&E\	<a href="#">80336.doc</a>	LONGITUDINAL JOINT AND CRACK PATCHING	E 04/01/14 R 04/01/16
ZD&E\	<a href="#">80338.doc</a>	PORTLAND CEMENT CONCRETE PARTIAL DEPTH HOT-MIX ASPHALT PATCHING	E 04/01/14 R 04/01/16
ZD&E\	<a href="#">80340.doc</a>	SPEED DISPLAY TRAILER	E 04/02/14 R 01/01/17
ZD&E\	<a href="#">80347.doc</a>	HOT MIX ASPHALT - PAY FOR PERFORMANCE USING PERCENT WITHIN LIMITS - JOBSITE SAMPLING	E 11/01/14 R 04/01/17
ZD&E\	<a href="#">80349.doc</a>	PAVEMENT MARKING BLACKOUT TAPE	E 11/01/14 R 04/01/16
ZD&E\	<a href="#">80359.doc</a>	PORTLAND CEMENT CONCRETE BRIDGE DECK CURING	E 04/01/15 R 01/01/17
ZD&E\	<a href="#">80366.doc</a>	BUTT JOINTS	E 07/01/16
ZD&E\	<a href="#">80367.doc</a>	LIGHT POLES	E 07/01/16
ZD&E\	<a href="#">80368.doc</a>	LIGHT TOWER	E 07/01/16
ZD&E\	<a href="#">80369.doc</a>	MAST ARM ASSEMBLY AND POLE	E 07/01/16
ZD&E\	<a href="#">80371.doc</a>	PAVEMENT MARKING REMOVAL	E 07/01/16
ZD&E\	<a href="#">80376.doc</a>	HOT-MIX ASPHALT - TACK COAT	E 11/01/16
ZD&E\	<a href="#">80377.doc</a>	PORTABLE CHANGEABLE MESSAGE SIGNS	E 11/01/16 R 04/01/17
ZD&E\	<a href="#">80378.docx</a>	DOWEL BAR INSERTER	E 01/01/17
ZD&E\	<a href="#">80379.doc</a>	STEEL PLATE BEAM GUARDRAIL	E 01/01/17
ZD&E\	<a href="#">80380.doc</a>	TUBULAR MARKERS	E 01/01/17
ZD&E\	<a href="#">80381.doc</a>	TRAFFIC BARRIER TERMINAL, TYPE 1 SPECIAL	E 01/01/17
ZD&E\	<a href="#">80382.doc</a>	ADJUSTING FRAMES AND GRATES	E 04/01/17
ZD&E\	<a href="#">80383.doc</a>	HOT MIX ASPHALT - QUALITY CONTROL FOR PERFORMANCE	E 04/01/17 R 04/02/17
ZD&E\	<a href="#">80384.doc</a>	COMPENSABLE DELAY COSTS	E 06/02/17
ZD&E\	<a href="#">80385.doc</a>	PORTLAND CEMENT CONCRETE SIDEWALK	E 08/01/17

## **AGGREGATE SUBGRADE IMPROVEMENT (D-1)**

Effective: February 22, 2012

Revised: April 1, 2016

Add the following Section to the Standard Specifications:

### **“SECTION 303. AGGREGATE SUBGRADE IMPROVEMENT**

**303.01 Description.** This work shall consist of constructing an aggregate subgrade improvement.

**303.02 Materials.** Materials shall be according to the following.

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

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

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

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

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

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

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

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



**303.07 Compaction.** All aggregate lifts shall be compacted to the satisfaction of the Engineer. If the moisture content of the material is such that compaction cannot be obtained, sufficient water shall be added so that satisfactory compaction can be obtained.

**303.08 Finishing and Maintenance of Aggregate Subgrade Improvement.** The aggregate subgrade improvement shall be finished to the lines, grades, and cross sections shown on the plans, or as directed by the Engineer. The aggregate subgrade improvement shall be maintained in a smooth and compacted condition.

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

**303.10 Basis of Payment.** This work will be paid for at the contract unit price per cubic yard (cubic meter) for AGGREGATE SUBGRADE IMPROVEMENT or at the contract unit price per square yard (square meter) for AGGREGATE SUBGRADE IMPROVEMENT, of the thickness specified.

Add the following to Section 1004 of the Standard Specifications:

**“1004.07 Coarse Aggregate for Aggregate Subgrade Improvement.** The aggregate shall be according to Article 1004.01 and the following.

- (a) Description. The coarse aggregate shall be crushed gravel, crushed stone, or crushed concrete. The top 12 inches of the aggregate subgrade improvement shall be 3 inches of capping material and 9 inches of crushed gravel, crushed stone or crushed concrete. In applications where greater than 36 inches of subgrade material is required, rounded gravel, meeting the CS01 gradation, may be used beginning at a depth of 12 inches below the bottom of pavement.
- (b) Quality. The coarse aggregate shall consist of sound durable particles reasonably free of deleterious materials. Non-mechanically blended RAP may be allowed up to a maximum of 5.0 percent.
- (c) Gradation.
  - (1) The coarse aggregate gradation for total subgrade thicknesses of 12 in. (300 mm) or greater shall be CS 01.

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

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

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



## **COARSE AGGREGATE FOR BACKFILL, TRENCH BACKFILL AND BEDDING (D-1)**

Effective: November 1, 2011

Revised: November 1, 2013

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

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

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

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## **RECLAIMED ASPHALT PAVEMENT AND RECLAIMED ASPHALT SHINGLES (D-1)**

Effective: November 1, 2012

Revise: April 1, 2017

Revise Section 1031 of the Standard Specifications to read:

### **“SECTION 1031. RECLAIMED ASPHALT PAVEMENT AND RECLAIMED ASPHALT SHINGLES**

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

- (a) Reclaimed Asphalt Pavement (RAP). RAP is the material resulting from cold milling or crushing an existing hot-mix asphalt (HMA) pavement. RAP will be considered processed FRAP after completion of both crushing and screening to size. The Contractor shall supply written documentation that the RAP originated from routes or airfields under federal, state, or local agency jurisdiction.
- (b) Reclaimed Asphalt Shingles (RAS). Reclaimed asphalt shingles (RAS). RAS is from the processing and grinding of preconsumer or post-consumer shingles. RAS shall be a clean and uniform material with a maximum of 0.5 percent unacceptable material, as defined in Bureau of Materials and Physical Research Policy Memorandum, “Reclaimed Asphalt Shingle (RAS) Sources”, by weight of RAS. All RAS used shall come from a Bureau of Materials and Physical Research approved processing facility where it shall be ground and processed to 100 percent passing the 3/8 in. (9.5 mm) sieve and 90 percent passing the #4 (4.75 mm) sieve. RAS shall meet the testing requirements specified herein. In addition, RAS shall meet the following Type 1 or Type 2 requirements.
  - (1) Type 1. Type 1 RAS shall be processed, preconsumer asphalt shingles salvaged from the manufacture of residential asphalt roofing shingles.
  - (2) Type 2. Type 2 RAS shall be processed post-consumer shingles only, salvaged from residential, or four unit or less dwellings not subject to the National Emission Standards for Hazardous Air Pollutants (NESHAP).

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

- (a) RAP Stockpiles. The Contractor shall construct individual, sealed RAP stockpiles meeting one of the following definitions. Additional processed RAP (FRAP) shall be stockpiled in a separate working pile, as designated in the QC Plan, and only added to the sealed stockpile when test results for the working pile are complete and are found to meet tolerances specified herein for the original sealed FRAP stockpile. Stockpiles shall be sufficiently separated to prevent intermingling at the base. All stockpiles (including

unprocessed RAP and FRAP) shall be identified by signs indicating the type as listed below (i.e. "Non- Quality, FRAP -#4 or Type 2 RAS", etc...).

- (1) Fractionated RAP (FRAP). FRAP shall consist of RAP from Class I, Superpave HMA (High and Low ESAL) or equivalent mixtures. The coarse aggregate in FRAP shall be crushed aggregate and may represent more than one aggregate type and/or quality, but shall be at least C quality. All FRAP shall be processed prior to testing and sized into fractions with the separation occurring on or between the #4 (4.75 mm) and 1/2 in. (12.5 mm) sieves. Agglomerations shall be minimized such that 100 percent of the RAP in the coarse fraction shall pass the maximum sieve size specified for the mix the FRAP will be used in.
- (2) Restricted FRAP (B quality) stockpiles shall consist of RAP from Class I, Superpave (High ESAL), or HMA (High ESAL). If approved by the Engineer, the aggregate from a maximum 3.0 in. (75 mm) single combined pass of surface/binder milling will be classified as B quality. All millings from this application will be processed into FRAP as described previously.
- (3) Conglomerate. Conglomerate RAP stockpiles shall consist of RAP from Class I, Superpave HMA (High and Low ESAL) or equivalent mixtures. The coarse aggregate in this RAP shall be crushed aggregate and may represent more than one aggregate type and/or quality, but shall be at least C quality. This RAP may have an inconsistent gradation and/or asphalt binder content prior to processing. All conglomerate RAP shall be processed (FRAP) prior to testing. Conglomerate RAP stockpiles shall not contain steel slag or other expansive material as determined by the Department.
- (4) Conglomerate "D" Quality (DQ). Conglomerate DQ RAP stockpiles shall consist of RAP from HMA shoulders, bituminous stabilized subbases or Superpave (Low ESAL)/HMA (Low ESAL) IL-19.0L binder mixture. The coarse aggregate in this RAP may be crushed or round but shall be at least D quality. This RAP may have an inconsistent gradation and/or asphalt binder content. Conglomerate DQ RAP stockpiles shall not contain steel slag or other expansive material as determined by the Department.
- (5) Non-Quality. RAP stockpiles that do not meet the requirements of the stockpile categories listed above shall be classified as "Non-Quality".

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

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

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

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

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

- (a) FRAP Testing. When used in HMA, the FRAP shall be sampled and tested either during processing or after stockpiling. It shall also be sampled during HMA production.
  - (1) During Stockpiling. For testing during stockpiling, washed extraction samples shall be run at the minimum frequency of one sample per 500 tons (450 metric tons) for the first 2000 tons (1800 metric tons) and one sample per 2000 tons (1800 metric tons) thereafter. A minimum of five tests shall be required for stockpiles less than 4000 tons (3600 metric tons).
  - (2) Incoming Material. For testing as incoming material, washed extraction samples shall be run at a minimum frequency of one sample per 2000 tons (1800 metric tons) or once per week, whichever comes first.
  - (3) After Stockpiling. For testing after stockpiling, the Contractor shall submit a plan for approval to the District proposing a satisfactory method of sampling and testing the RAP/FRAP pile either in-situ or by restockpiling. The sampling plan shall meet the minimum frequency required above and detail the procedure used to obtain representative samples throughout the pile for testing.

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

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

- (1) During Stockpiling. Washed extraction and testing for unacceptable materials shall be run at the minimum frequency of one sample per 200 tons (180 metric tons) for the first 1000 tons (900 metric tons) and one sample per 1000 tons (900 metric tons) thereafter. A minimum of five samples are required for stockpiles less than 1000 tons (900 metric tons). Once a  $\leq 1000$  ton (900 metric ton), five-sample/test stockpile has been established it shall be sealed. Additional incoming RAS shall be in a separate working pile as designated in the Quality Control plan and only added to the sealed stockpile when the test results of the working pile are complete and are found to meet the tolerances specified herein for the original sealed RAS stockpile.
- (2) Incoming Material. For testing as incoming material at the HMA plant, washed extraction shall be run at the minimum frequency of one sample per 250 tons (227 metric tons). A minimum of five samples are required for stockpiles less than 1000 tons (900 metric tons). The incoming material test results shall meet the tolerances specified herein.

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

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

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

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

Parameter	FRAP
No. 4 (4.75 mm)	$\pm 6 \%$
No. 8 (2.36 mm)	$\pm 5 \%$
No. 30 (600 $\mu\text{m}$ )	$\pm 5 \%$
No. 200 (75 $\mu\text{m}$ )	$\pm 2.0 \%$
Asphalt Binder	$\pm 0.3 \%$
$G_{mm}$	$\pm 0.03$ <sup>1/</sup>

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

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

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

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

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

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

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

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

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

The Engineer will notify the Contractor of observed deficiencies.

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

Test Parameter	Acceptable Limits of Precision	
	FRAP	RAS
% Passing: <sup>1/</sup>		
1/2 in.	5.0%	
No. 4	5.0%	
No. 8	3.0%	4.0%
No. 30	2.0%	4.0%
No. 200	2.2%	4.0%
Asphalt Binder Content	0.3%	3.0%
G <sub>mm</sub>	0.030	

1/ Based on washed extraction.

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

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

#### **1031.05 Quality Designation of Aggregate in RAP and FRAP.**

- (a) RAP. The aggregate quality of the RAP for homogeneous, conglomerate, and conglomerate "D" quality stockpiles shall be set by the lowest quality of coarse aggregate in the RAP stockpile and are designated as follows.
- (1) RAP from Class I, Superpave/HMA (High ESAL), or (Low ESAL) IL-9.5L surface mixtures are designated as containing Class B quality coarse aggregate.
  - (2) RAP from Superpave/HMA (Low ESAL) IL-19.0L binder mixture is designated as Class D quality coarse aggregate.
  - (3) RAP from Class I, Superpave/HMA (High ESAL) binder mixtures, bituminous base course mixtures, and bituminous base course widening mixtures are designated as containing Class C quality coarse aggregate.
  - (4) RAP from bituminous stabilized subbase and BAM shoulders are designated as containing Class D quality coarse aggregate.
- (b) FRAP. If the Engineer has documentation of the quality of the FRAP aggregate, the Contractor shall use the assigned quality provided by the Engineer.

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

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

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

- (1) Coarse Aggregate Size (after extraction). The coarse aggregate in all FRAP shall be equal to or less than the nominal maximum size requirement for the HMA mixture to be produced.
- (2) Steel Slag Stockpiles. FRAP stockpiles containing steel slag or other expansive material, as determined by the Department, shall be homogeneous and will be approved for use in HMA (High ESAL and Low ESAL) mixtures regardless of lift or mix type.
- (3) Use in HMA Surface Mixtures (High and Low ESAL). FRAP stockpiles for use in HMA surface mixtures (High and Low ESAL) shall have coarse aggregate that is Class B quality or better. FRAP shall be considered equivalent to limestone for frictional considerations unless produced/screened to minus 3/8 inch.
- (4) Use in HMA Binder Mixtures (High and Low ESAL), HMA Base Course, and HMA Base Course Widening. FRAP stockpiles for use in HMA binder mixtures (High and Low ESAL), HMA base course, and HMA base course widening shall be FRAP in which the coarse aggregate is Class C quality or better.
- (5) Use in Shoulders and Subbase. FRAP stockpiles for use in HMA shoulders and stabilized subbase (HMA) shall be FRAP, Restricted FRAP, conglomerate, or conglomerate DQ.

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



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

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

Max Asphalt Binder Replacement for FRAP with RAS Combination

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

- 1/ For Low ESAL HMA shoulder and stabilized subbase, the percent asphalt binder replacement shall not exceed 50 % of the total asphalt binder in the mixture.
- 2/ When the binder replacement exceeds 15 % for all mixes, except for SMA and IL-4.75, the high and low virgin asphalt binder grades shall each be reduced by one grade (i.e. 25 % binder replacement using a virgin asphalt binder grade of PG64-22 will be reduced to a PG58-28). When constructing full depth HMA and the ABR is less than 15 %, the required virgin asphalt binder grade shall be PG64-28.
- 3/ When the ABR for SMA or IL-4.75 is 15 % or less, the required virgin asphalt binder shall be SBS PG76-22 and the elastic recovery shall be a minimum of 80. When the ABR for SMA or IL-4.75 exceeds 15%, the virgin asphalt binder grade shall be SBS PG70-28 and the elastic recovery shall be a minimum of 80.
- 4/ When FRAP or RAS is used alone, the maximum percent asphalt binder replacement designated on the table shall be reduced by 10 %.

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

- (a) FRAP and/or RAS. FRAP and /or RAS mix designs shall be submitted for verification. If additional FRAP or RAS stockpiles are tested and found to be within tolerance, as defined under "Evaluation of Tests" herein, and meet all requirements herein, the

additional FRAP or RAS stockpiles may be used in the original design at the percent previously verified.

- (b) RAS. Type 1 and Type 2 RAS are not interchangeable in a mix design. A RAS stone bulk specific gravity (Gsb) of 2.300 shall be used for mix design purposes.

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

To remove or reduce agglomerated material, a scalping screen, gator, crushing unit, or comparable sizing device approved by the Engineer shall be used in the RAS and FRAP feed system to remove or reduce oversized material. If material passing the sizing device adversely affects the mix production or quality of the mix, the sizing device shall be set at a size specified by the Engineer.

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

- (a) RAS. RAS shall be incorporated into the HMA mixture either by a separate weight depletion system or by using the RAP weigh belt. Either feed system shall be interlocked with the aggregate feed or weigh system to maintain correct proportions for all rates of production and batch sizes. The portion of RAS shall be controlled accurately to within  $\pm 0.5$  percent of the amount of RAS utilized. When using the weight depletion system, flow indicators or sensing devices shall be provided and interlocked with the plant controls such that the mixture production is halted when RAS flow is interrupted.
- (b) HMA Plant Requirements. HMA plants utilizing FRAP and/or RAS shall be capable of automatically recording and printing the following information.
  - (1) Dryer Drum Plants.
    - a. Date, month, year, and time to the nearest minute for each print.
    - b. HMA mix number assigned by the Department.
    - c. Accumulated weight of dry aggregate (combined or individual) in tons (metric tons) to the nearest 0.1 ton (0.1 metric ton).
    - d. Accumulated dry weight of RAS and FRAP in tons (metric tons) to the nearest 0.1 ton (0.1 metric ton).
    - e. Accumulated mineral filler in revolutions, tons (metric tons), etc. to the nearest 0.1 unit.

- f. Accumulated asphalt binder in gallons (liters), tons (metric tons), etc. to the nearest 0.1 unit.
  - g. Residual asphalt binder in the RAS and FRAP material as a percent of the total mix to the nearest 0.1 percent.
  - h. Aggregate RAS and FRAP moisture compensators in percent as set on the control panel. (Required when accumulated or individual aggregate and RAS and FRAP are printed in wet condition.)
  - i. When producing mixtures with FRAP and/or RAS, a positive dust control system shall be utilized.
  - j. Accumulated mixture tonnage.
  - k. Dust Removed (accumulated to the nearest 0.1 ton (0.1 metric ton))
- (2) Batch Plants.
- a. Date, month, year, and time to the nearest minute for each print.
  - b. HMA mix number assigned by the Department.
  - c. Individual virgin aggregate hot bin batch weights to the nearest pound (kilogram).
  - d. Mineral filler weight to the nearest pound (kilogram).
  - f. RAS and FRAP weight to the nearest pound (kilogram).
  - g. Virgin asphalt binder weight to the nearest pound (kilogram).
  - h. Residual asphalt binder in the RAS and FRAP material as a percent of the total mix to the nearest 0.1 percent.

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

**1031.09 RAP in Aggregate Surface Course and Aggregate Wedge Shoulders, Type B.**

The use of RAP or FRAP in aggregate surface course and aggregate shoulders shall be as follows.

- (a) Stockpiles and Testing. RAP stockpiles may be any of those listed in Article 1031.02, except "Non-Quality" and "FRAP". The testing requirements of Article 1031.03 shall not apply. RAP used shall be according to the current Bureau of Materials and Physical

Research Policy Memorandum, "Reclaimed Asphalt Pavement (RAP) for Aggregate Applications".

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

APPENDIX E  
CHICAGO TRANSIT AUTHORITY  
SELECTED SPECIFICATIONS

## APPENDIX E

### **CHICAGO TRANSIT AUTHORITY** **APPENDIX TO SPECIAL PROVISIONS**

SECTION NUMBER	SPECIFICATION NAME
02 41 19	Selective Structure Demolition
03 20 10	Concrete Reinforcement Epoxy Coated
03 30 00	Cast-in-Place Concrete
05 10 30	Structural Steel
09 90 00	Painting
09 90 10	Cleaning and Protective Coatings of Existing Surfaces
31 09 13	Geotechnical and Structural Instrumentation and Monitoring
31 15 00	Structural Shoring
	CTA Requirements for Contractors Working along the Right-of-Way (R.O.W.)

SECTION 02 41 19  
SELECTIVE STRUCTURE DEMOLITION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

- A. This Section includes the demolition, removal and proper disposal of the items indicated on the drawings to be removed and any other items to be removed as required to facilitate the installation of the new work; including the following:
  - 1. Built-up steel columns
  - 2. Portions of steel cross girders and bracing
  - 3. Concrete column bases to 2' minimum below proposed grade
  - 4. Existing rivets or bolts and structural steel, as required for the removal and/or replacement of the existing structural steel and the installation of new structural steel

Remove all other items as shown, indicated, or as otherwise required to facilitate the new construction.

- B. Any salvagable items to be reused are to be removed carefully to avoid damage to the items, stored and protected during the work until re-installed; including the following:
  - 1. None
  - 2. None
- C. Protect existing to remain items at the roof from damage during the demolition and new work.
- D. Contractor to avoid excessive concentrated loads beyond the 30 or 40 lbs per sq. ft. design live loads when storing material on the roof or floor, respectively.
- E. The areas currently occupied must remain operational at all times unless approved otherwise. Coordinate any construction and/or staging activities that may impede normal CTA operations with the Authority including, but not limited to, any activity that generates excessive noise or airborne dust; interference with the Authority's operations; access or use by the Authority's customers or public; or the safety of employees, customers of the public. The Contractor shall schedule the access to the work, use of the facility and other issues pertaining to the demolition and construction with the Authority to minimize disruption to the Authority's operations and protect other areas of the building from damage and allow for safe passage of personnel.
- F. All internal areas of the building, platforms, tracks, storage and equipment must be protected from water, debris, dust and damage at all times.
- G. Provide safety protection system around work area to protect pedestrians, vehicles, customers and CTA personnel. When working at roofs or other raised areas, provide and install an approved safety net system for the perimeter of the roof or floor to prevent debris and materials from falling on the tracks or other areas below. Safety net materials and installation to be submitted to the Authority for approval.
- H. Work includes providing, installing, maintaining and removing temporary construction barriers as required during the course of the work. Work includes providing, installing and removing

foot traffic barricades and control devices and signage as required during the course of the work and as approved by the Authority. Construction barriers to be of plywood and wood framing unless approved otherwise.

- I. Contractor to provide a staging plan and safety plan for the Authority's approval prior to starting the work. Coordinate with the Authority for staging areas.
- J. Contractor shall schedule and coordinate all work with the Authority. Contractor shall submit and obtain approval on a process plan and phasing plan for all the work, including demolition prior to commencing work on site.
- K. Contractor to refer to and adhere to the Drawings, Specifications and other documents provided for this Project.
- L. Provide for flagging of trains as required, scheduled and approved by the Authority.
- M. Contractor to protect the remainder of the existing structure during demolition and construction. Buildings must be protected from moisture and the elements. Any equipment inside buildings must be protected from dust, debris, moisture, the elements and other damage during the demolition and construction.
  - 1. Protect all roof drains during demolition and construction at the roof level.
- N. Coordinate and review the removal, relocation and/or reinstallation of electrical work and equipment, communication equipment, antennas and other specialty items with the Authority prior to beginning the work to maintain their functionality and avoid damage to the items or systems. Work may require re-routing utility lines as required to avoid the demolition and/or new construction.
- O. Work may include patching and repairs to existing adjacent surfaces after removal or demolition. Work includes coring and cutting existing surfaces for installation of new plumbing piping and electrical conduit. Patch upon completion. Patching and repairs to match existing materials and finishes.
- P. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 01 Section "Summary of Work".
  - 2. Division 01 Section "Cutting and Patching" for cutting and patching procedures for selective demolition operations.
  - 3. Division 02 Sections for environmental including asbestos abatement, lead abatement and soil remediation.
  - 4. Division 06 Section "Carpentry" for material and construction requirements for temporary enclosures.

### 1.03 DEFINITIONS

- A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Authority's property.
- B. Remove and Salvage for Recycling: Items indicated to be removed and recycled are to be separated and arranged for recycling. Construction debris from demolition and construction waste materials are to be picked up by recycling waste haulers for recycling to the greatest extent possible. As a minimum requirement, the Contractor to follow the City of Chicago Ordinance for recycling construction debris.
- B. Remove and Salvage for Re-use: Items indicated to be removed and salvaged remain the Authority's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Authority's designated storage area.
- C. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them



for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated.

- D. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Authority, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

#### 1.04 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged for re-use, reinstalled, or otherwise indicated to remain the Authority's property, demolished materials shall become the Contractor's property and shall be removed from the site and legally disposed of by the Contractor.

#### 1.05 SUBMITTALS

- A. General: Submit each item in this Article according to the conditions of the contract and Division 01 Specification Sections, for approval, unless otherwise indicated:
  - 1. Proposed dust-control measures.
  - 2. Proposed noise-control measures.
  - 3. Schedule of demolition activities indicating the following:
    - a. For each location: Detailed sequence of demolition and removal work, with starting and ending dates for each activity.
    - b. Interruption of utility services.
    - c. Coordination for shutoff, capping, and continuation of utility services.
    - d. Detailed sequence of selective demolition and removal work to ensure uninterrupted progress of Authority's on-site operations.
    - e. Locations of temporary partitions, barriers and means of egress.
    - f. Foot traffic control or interruption. Closing of areas.
    - g. Shoring required.
    - h. Indicate how demolition work will avoid interruption of Authority's on-site operations.
    - i. Demolition plan.
  - 4. Proposed recycling procedures.
  - 5. Inventory of items to be removed and salvaged for re-use.
- B. Contractor to submit a process plan and phasing plan for the demolition work.
- C. Contractor to submit proposed barricades, control devices and signage as required during the demolition and other work; including the proposed location of the barricades, control devices and signage; and the materials proposed to be used for the barricades, control devices and signage; for the Authority's review and approval.
- D. Provide the following, for information purposes:
  - 1. Photographs or videotape for information purposes, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by selective demolition operations.
- E. Provide the following at Project Closeout according to Division 01 Section "Project Closeout":
  - 1. Record drawings; including identification and accurate locations of capped utilities and other subsurface structural, electrical, or mechanical conditions.

- F. Provide written and dated documentation of the total amount of each different waste material, the amount of each sent to a recycling facility and the amount of each sent to a landfill. Documentation shall be done on a daily basis. Indicate when and who the materials were picked up by and the name of the recycling facility the materials were sent to.
- G. A demolition plan is to be submitted to the Authority for approval. Demolition shall not commence until the contractor has received written approval from the Authority.

1.06 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction. Comply with City of Chicago Recycling Ordinance.

1.07 PROJECT CONDITIONS

- A. Contractor required to survey existing conditions to verify all existing dimensions and conditions, locations of items and construction sizes of items and including conditions and limitations under which he is to do his work.
- B. Contractor required to locate all existing utilities and other improvements, including utilities not exposed to view.
- C. There will be no extras allowed to compensate Contractor for his failure to review and verify existing conditions and dimensions.
- D. Demolition work to adhere to phasing plans for the project.

1.08 HAZARDOUS MATERIALS

- A. The Authority has determined that various components to be removed or to be painted may contain lead paint. These components shall be removed according to all applicable federal, state and local regulations including. This shall include 29 CFR1926.62 and 29 CFR1910.1025 under the Occupational Safety and Health Act, Toxic Substance and Control Act, Resource Conservation and Recovery Act, Illinois Lead Poisoning Prevention Act (77 Illinois Adm. Code 845) and City of Chicago Code 11-4-2190 (Sandblasting, grinding and chemical washing of building, facilities or other structures; permit and notification requirements; performance standards for lead paint abatement; and disposal of debris.) Contractor shall submit removal or mitigation plan to the Authority for approval.
- B. For structures noted to be re-painted; existing paint that is loose, flaking, or otherwise not recommended to remain under the new paint system; is to be removed and, unless determined otherwise, should be assumed to contain lead. The following lead paint removal procedures shall be followed:
  - 1. Work is governed by OSHA Regulations (worker protection) and NESHAP Regulations (visible emissions).
  - 2. City of Chicago Sandblasting, Grinding and Chemical Washing Ordinance is not applicable as long as hand scrapping removal method is used. Any mechanical methods or chemical removal would require City permits. CTA Facilities Maintenance shall coordinate with Environmental Affairs if Permits are required.
  - 3. Employees conducting lead abatement shall be licensed by IDPH as a lead abatement worker and/or supervisor.
  - 4. Lead paint work area shall be separated by caution tape or other appropriate barrier.
  - 5. Work area shall be covered with appropriate non-skid (canvas) tarpaulin. This tarpaulin shall be cleaned with a HEPA vacuum after each shift or prior to moving tarpaulin. Paint chips and collected dust shall be bagged and disposed of as lead waste. Contact Environmental Affairs (312-681-3869) for disposal.
  - 6. Employee shall wet impact surface to prevent dust during scraping activity.

7. Employees shall wear disposable coveralls during lead abatement activity. Coveralls shall be disposed as lead waste.
  8. Employees shall wear appropriate respirators. CTA may conduct air sample (negative exposure assessment) to determine airborne lead dust exposure.
  9. Employees shall maintain good personnel hygiene by washing their hands and face prior to eating, drinking, smoking, or leaving the site.
- C. Other than the lead paint referred to above, the Contractor is not responsible to remove hazardous material that is encountered in the course of the work and not identified as hazardous material in the contract documents or otherwise addressed in the contract documents. If previously unidentified hazardous material is encountered, do not disturb the materials. Immediately notify the Authority for direction and arrangement for proper removal by licensed asbestos abatement workers and proper disposal.
- D. Material containing lead based paint to be disposed of as hazardous waste, according to all applicable laws and regulations, unless approved otherwise, at Contractor's expense and at approved land fills. Do not allow lead dust to contaminate other surfaces. The Contractor shall be responsible for handling, transporting, and disposing of any hazardous materials generated during the course of the project in accordance with all applicable federal, state and local environmental regulations and codes.

## PART 2 PRODUCTS

### 2.01 REPAIR MATERIALS

- A. Use repair materials identical to existing materials.
1. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
  2. Use materials whose installed performance equals or surpasses that of existing materials.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that those utilities indicated and approved to be disconnected and capped, have been properly done so.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required. All work indicated may vary based on actual field conditions and dimensions. Additional demolition and/or patching may be required depending on the condition of materials and construction upon opening up the existing construction and actual justification and/or attachment of the materials.
- C. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Authority.
- D. Survey the condition of the building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective demolition.
- E. Perform surveys as the work progresses to detect hazards resulting from selective demolition activities.

### 3.02 UTILITY SERVICES

- A. Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  - 1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Authority and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Authority and to governing authorities.
    - a. Provide not less than 72 hours' notice to Authority if shutdown of service is required during changeover.
- B. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving building to be selectively demolished.
  - 1. Arrange to shut off indicated utilities with utility companies.
  - 2. Where utility services are required to be removed, relocated, or abandoned, provide bypass connections to maintain continuity of service to other parts of the building before proceeding with selective demolition.
  - 3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit after bypassing.
- C. Utility Requirements: Refer to their respective sections of these specifications for shutting off, disconnecting, removing, and sealing or capping utility services. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

### 3.03 PREPARATION

- A. Conduct demolition operations and remove debris to ensure minimum interference with adjacent occupied and used facilities.
  - 1. Do not close or obstruct adjacent occupied or used facilities without permission from Authority and authorities having jurisdiction. Provide alternate routes around closed or obstructed foot traffic ways.
  - 2. Do not block required exits or stairways.
- B. Conduct demolition operations to prevent injury to people and damage to adjacent facilities to remain. Ensure safe passage of people around selective demolition area.
  - 1. Protect walls, ceilings, floors, and other existing finish work that are to remain and are exposed during selective demolition operations.
  - 2. Cover and protect equipment that has not been removed.
- C. Erect and maintain dust-proof partitions and temporary enclosures as required to limit dust and dirt migration and to separate areas from fumes and noise.
- D. If required, provide and maintain shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of building components during selective demolition and until new support is installed.

### 3.04 POLLUTION CONTROLS

- A. Use temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.
- B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

- C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

### 3.05 SELECTIVE DEMOLITION

- A. Demolish and remove existing construction only to the extent required by new construction and as indicated on the drawings. Use methods required to complete work within limitations of governing regulations and as follows:
  - 1. Proceed with selective demolition systematically.
  - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. To minimize disturbance of adjacent surfaces, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
  - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  - 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
  - 5. Maintain adequate ventilation when using cutting torches.
  - 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
  - 7. Locate selective demolition equipment throughout the structure and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  - 8. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
  - 9. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.
- B. Demolish masonry in small sections. Cut masonry at junctures with construction to remain, using power-driven masonry saw or hand tools; do not use power-driven impact tools. Sawcut between existing masonry to be removed and to remain.
- C. Demolish and remove existing construction according to the IDOT Standard Specifications for Road and Bridge Construction, Section 501, Removal of Existing Structures.
- D. The Contractor is fully responsible for the means and method of demolition and the integrity and stability of the existing structure during demolition until the work is completed.
- E. Do not remove more of the existing structure than indicated on the drawings or as required. Do not damage, mar, cut or deface the remaining structure to remain or material to be reused.
- F. Verify all dimensions and existing conditions.

### 3.06 PATCHING AND REPAIRS

- A. Promptly patch and repair holes and damaged surfaces caused by demolition operations to match adjacent construction.
- B. Patching is specified in Division 01 Section "Cutting and Patching."
- C. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials. Patch to match existing, using materials to match existing.

1. Completely fill holes and depressions in existing masonry or concrete to remain with an approved masonry or concrete patching material, applied according to manufacturer's printed specifications.
- D. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.
- E. Patch and repair floor, ceiling and wall surfaces in the new space where demolished walls or partitions extend one finished area into another. Provide a flush and even surface of uniform color and appearance.
  1. Closely match texture and finish of existing adjacent surface.
  2. Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
  3. Where patching smooth painted surfaces, extend final paint coat over entire unbroken surface containing the patch after the surface has received primer and second coat.
  4. Where applicable, remove existing floor and wall finishes and replace with new materials, if necessary, to achieve uniform color and appearance.
- F. Repairs, patching and replacements due to damage by the Contractor are the complete responsibility of the Contractor.

### 3.07 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Promptly dispose of demolished materials, accumulated debris, rubbish, and other materials resulting from demolition operations. Do not allow demolished materials to accumulate on-site except as required for recycling operations.
- B. Recycle construction debris from demolition operations and construction waste to the greatest extent possible. Contractor must follow City of Chicago Recycling of Construction Debris Ordinance as a minimum requirement.
- C. Concrete, masonry, steel, wood, glass, cardboard and other materials shall be separated at the construction site and pick up shall be arranged with their respective recycling waste haulers for recycling of the individual waste materials.
- D. Provide written and dated documentation of the total amount of each different waste material, the amount of each sent to a recycling facility and the amount of each sent to a landfill. Documentation shall be done on a daily basis. Indicate when and who the materials were picked up by and the name of the recycling facility the materials were sent to.
- E. Disposal of non-recyclable debris: Transport materials that are not suitable for recycling off Authority's property and legally dispose of them.

### 3.09 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.
- B. Sweep the building broom clean on completion of selective demolition operation.
- C. Change filters on air-handling equipment on completion of selective demolition operations.

END OF SECTION

SECTION 03 20 10  
CONCRETE REINFORCEMENT EPOXY COATED

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. The work under this Section shall consist of furnishing all labor, materials, and equipment required for furnishing, fabricating and placing reinforcement steel used in concrete slabs and structures, including bars, mesh, ties, supports, chairs, spacers, clips and all other appurtenant work. All reinforcing bars, mesh and accessories to be epoxy coated.
- B. Related Sections: The following sections contain requirements that relate to this Section.
1. Section 01 45 23 - Testing and Inspection Service
  2. Division 03 Sections, Concrete
  3. Section 03 30 00 - Cast-In-Place Concrete
  4. Section 03 40 00 – Precast Structural Concrete
  5. Section 03 41 00 – Precast Concrete Platform
  6. Section 04 80 00 – Unit Masonry

1.03 REFERENCES

- A. Except as modified herein, the work shall conform to the applicable portions of the Standard Specifications. Where reference is made to one of the below standards, the version in effect at the time of bid opening shall apply.
- B. American Society for Testing and Materials (ASTM)
1. ASTM A 36 – Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Steel Piling.
  2. ASTM A 82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
  3. ASTM A 184 - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
  4. ASTM A 185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
  5. ASTM A 307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  6. ASTM A 615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
  7. ASTM A 706 – Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
  8. ASTM A 743 – Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion-Resistant, for General Application.
  9. ASTM A 775 – Specification for Epoxy-Coated Reinforcing Steel Bars.
  10. ASTM A 884 – Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement.
  11. ASTM A994 – Standard Test Method for Comparing Bond Strength of Reinforcing Bar to Concrete Using Beam-End Specimens.
  12. ASTM A 1064 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
  13. ASTM D 3963 – Standard Specification for the Fabrication and Job Site Handling of Epoxy – Coated Reinforcing Steel Bars.

14. ASTM E 376 – Practice for Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Test Methods.
15. ASTM F 1554 – Standard Specification for Anchor Bolts, Steel, 36, 55 and 105 ksi Yield Strength.

C. American Concrete Institute (ACI)

1. ACI 117 - Standard Specification for Tolerances for Concrete Construction and Materials.
2. ACI 301 - Standard Specification for Structural Concrete.
3. ACI 315 - Details and Detailing of Concrete Reinforcement.
4. ACI 318 - Building Code Requirements for Structural Concrete.
5. ACI SP-66 - ACI Detailing Manual.

D. Concrete Reinforcing Steel Institute (CRSI)

1. Manual of Standard Practice.

E. American Welding Society (AWS)

1. AWS D1.1 – Structural Welding Code-Steel.
2. AWS D1.4 - Structural Welding Code - Reinforcing Steel.
3. AWS D12.1 – Recommended Practices for Welding Reinforcing Steel Metal Inserts, and Connections in Reinforced Concrete Construction.

F. American Railway Engineering and Maintenance-of-Way Association AREMA Manual.

G. IDOT Standard Specifications for Road and Bridge Construction (hereafter referred to as the Standard Specifications)

#### 1.04 SUBMITTALS

- A. Prior to performing the work, the Contractor shall submit to the Authority, in accordance with Section 01 33 00, a list of materials and product data for concrete reinforcement. Include all bars, mesh, and accessories.
- B. Provide certified copies from the supplier indicating the grade of steel being furnished, and reports on mill tests for chemical analysis, tensile strength, and bend tests for reinforcing bars and welded wire fabric. The Contractor shall certify, in writing, that material supplied meets or exceeds specified requirements. Supplier of reinforcing to certify the grade of steel being supplied meets these requirements.
- C. Contractor shall submit shop drawings showing materials of construction and installation details and spacing for concrete reinforcement; for review and approval. Include all bars, mesh and accessories.
- D. Provide reinforcing steel placing drawings for each portion of the work.
  1. All details, dimensions and information required for fabrication and placement of concrete reinforcement in accordance with Contract Documents, prepared in accordance with ACI 315 recommendations.
  2. Elevations, plans, sections, and dimensions of concrete work with required reinforcement clearances.
  3. Ledges, brackets, openings, sleeves, embedment's, electrical conduit and items of other trades including interference with reinforcing materials.
  4. Sizes, grade designations, spacing, locations, and quantities of wire fabric reinforcing steel, temperature and shrinkage reinforcement dowels.



- a. Do not use dimensions scaled from Contract Drawings to determine bar lengths.
  - b. Hooks and bends not specifically dimensioned shall be detailed per ACI 318.
- 5. Bending and cutting schedules, assembly diagrams, splicing and connection requirements, details, and laps.
- 6. Each type of supporting and spacing devices, including miscellaneous accessories.
- 7. Construction joint type, details and locations.
- 8. Placement drawings of concrete accessories and embedded items, including fabrication details of items to be placed. Drawings shall consolidate the work of all trades and shall be coordinated by the Contractor.
- 9. Reproduction of structural drawings as shop drawings is not permitted.
- E. Provide specifications for epoxy coating of reinforcing, mesh, and accessories. Provide certified copies of test results for epoxy coated reinforcing steel and accessories. The test reports shall indicate that the epoxy coating meets or exceeds ASTM A775 and ASTM D 3963. The certificates must be signed by the reinforcing fabricator or supplier and contain a detailed description of the material processed.
- F. Provide data for materials to be used for epoxy-coated reinforcing repair. Include manufacturer's recommended materials and manufacturer's recommendations for the repair of epoxy-coated reinforcing.
- G. If applicable, provide manufacturer's data for synthetic reinforcing fibers. Identify all placements that are to contain synthetic reinforcing fibers. The amount of fibers per cubic yard to be used for each placement shall be noted.
- H. Where welding of rebar to other metal embeds is required, Welder qualifications shall be submitted for record. Note, welded rebar splices are not permitted.
- I. Submit, for every epoxy bar or fabric delivery, an up to date copy of the epoxy coating fabrication plants CRSI epoxy coating plant certificate, that shows the plant is up to date and in good standing with the CRSI epoxy certification requirements.

#### 1.05 FABRICATION, DELIVERY, STORAGE, AND HANDLING

- A. Fabrication and handling of ECR shall be per ASTM D3963 and the Appendix of ASTM A775.
- B. Epoxy Coated Reinforcing: Deliver, store, and handle epoxy coated reinforcing in a manner to protect the epoxy coating from damage and in accordance with accepted industry standard.
- C. Reinforcing steel shall be shipped and stored with bars of the same size and shape fastened in bundles with durable tags, marked in legible manner with waterproof markings showing the same "mark " designations as those shown on the submitted Placing Drawings.
- D. Reinforcing steel with more than 2% of its coated surface area damaged in any given 1 ft. section shall be rejected per ASTM D3963 and replaced satisfactorily coated bar.
- E. Reinforcing steel with less than 2% of its coated surface area damaged in any given 1 ft. section shall be repaired with a two part epoxy material per the requirements ASTM D3963. A minimum of 7 mill dry film thickness of repair coating shall be provided.
- F. Store epoxy coated reinforcing off the ground on suitable pads to prevent damage and to allow air circulation for the prevention of wet storage stain.

## PART 2 PRODUCTS

### 2.01 REINFORCING BARS, FABRIC AND ACCESSORIES

- A. Epoxy-Coated Steel Reinforcement Bars: ASTM A615, Billet Steel Bars, Grade 60 all sizes, deformed and in accordance Section 1006.10 of the Standard Specifications. Bend epoxy coated bars by cold forming only; heated bending of coated bars not permitted. Repair damaged epoxy coating in accordance with ASTM A775.
- B. Epoxy-Coated Welded Wire Fabric: ASTM A884 fabric and epoxy-coated in accordance with ASTM A775/A775M and Section 1006.10 of the Standard Specifications. Furnish in sheets rather than rolls.
- C. Fabrication of reinforcement shall be in compliance with the CRSI Manual of Standard Practice and ACI 315 and ASTM A 143, A 384 and A 385, except as specified herein. Bars shall be cold bent. Avoid fabrication techniques that could cause distortion or embrittlement of steel. Bend bars before epoxy coating is applied to avoid damage to the epoxy coating. Bars shall not be straightened or re-bent.
- D. Bar Supports, General: Provide bar supports and other accessories in accordance with CRSI "Recommended Practice for Placing Reinforcing Bars", unless otherwise specified. Provide support to hold reinforcing in proper position while concrete is being placed. Where used over moisture barriers in slabs on grade, provide precast concrete supports or other type supports having bearing sand plates to prevent damaging the moisture barrier.
- E. Bar Supports and Accessories for Use With Epoxy-Coated Reinforcing: In addition to the general requirements for bar supports, comply with the following for use with epoxy-coated reinforcing.
  - 1. Wire Supports: Coated with dielectric material such as epoxy or plastic, compatible with concrete, for a distance at least 2" from the point of contact with the epoxy-coated reinforcing bars.
  - 2. Precast Concrete Block Supports: May be used for footing foundations and slabs-on-grade. Precast concrete blocks, if containing reinforcement, the metal reinforcement shall be coated with dielectric material such as epoxy, compatible with concrete.
  - 3. Plastic Supports: All plastic assembly, dielectric, compatible with concrete.
  - 4. Provide spreader bars, bar clips and spreaders, and other accessories coated with dielectric material such as epoxy compatible with concrete.

### 2.02 EPOXY COATING

- A. Coating material shall be any one of the epoxy resin powders which have been prequalified by the National Bureau of Standards and approved by the Authority.
- B. The coating applicator shall furnish to the Authority at the time of shipment written certification that the coated reinforcement bars were cleaned, coated and tested in accordance with the requirements of AASHTO M284 or ASTM A775 per the structure type.
- C. Epoxy coated reinforcement bars shall be tied with plastic or epoxy coated annealed wires, 16 gage or heavier. No. 9 tie down wires shall be epoxy coated.
- D. Bar supports shall conform to the "Bar Support Specifications" contained in "Manual of Standard Practice" as published by the Concrete Reinforcing Steel Institute and shall be Class C, Plastic Protected Bar Supports. Precast concrete block bar supports shall be used underneath bottom bars in foundations.

## 2.03 ACCESSORIES

### A. Tie Wire:

1. Type: Minimum 16 gauge annealed steel wire, ASTM A 82.
2. Wire Bar Type: Comply with CRSI.

### B. Splicing System:

1. Provide standard reinforcement splices by lapping ends, placing bars in contact, and tying tightly with wire in accordance with requirements of ACI 318 for minimum lap of spliced bars.
2. For mechanical tension and compression splices of reinforcing steel where specifically detailed on drawings, use Cadweld (C-series) splice, Dayton BAR-GRIP, NMB splice sleeve or Erico Lenton splices installed in strict compliance with manufacturer's requirements.
3. Tensile splicers shall be capable of developing 125% of the reinforcing steel ASTM specified minimum yield strength.
4. Compression splicers shall be the mechanical type such that the compression stress is transmitted by end bearing held in concentric contact.

### C. Supports of Reinforcement:

1. Types: Bolsters, chairs, spacers, clips, chair bars, and other devices for properly placing, spacing, supporting, and fastening the reinforcement epoxy coated to match supported reinforcement.
2. For Contact with Forms: Use types with not less than 3/32" of plastic between metal and concrete surface. Plastic tips shall extend not less than 1/2" on metal legs.
3. Individual and continuous slab bolsters and chairs shall be of type to suit various conditions encountered and must be capable of supporting 300 pound load without damage or permanent distortion.
4. Unless otherwise indicated on drawings, bottom reinforcing bars in footings shall be supported by precast concrete bricks or individual high chairs with welded sand plates on bottom.
5. For Slabs on Grade: Use supports with sand plates or horizontal runners where base material will not support chair legs.

### D. Adhesive Anchoring System for reinforcing dowels into existing concrete:

1. Acceptable products include but are not limited to: Adhesive for dowels in existing concrete shall be either EPCON C6+ Epoxy adhesive supplied by Red Head, HIT HY-200 injectable adhesive supplied by Hilti, Inc., Tulsa, Oklahoma, or Power-Fast Epoxy Injection Gel, supplied by Powers Rawl, Inc., New Rochelle, N.Y.
2. Engineered anchor system is specified on the General Notes of the Contract Drawings. Contractor shall provide calculations by a licensed structural engineer in the State of Illinois for alternate adhesive anchor system to show it is as good or better than the product specified on the drawings.

## 2.03 FABRICATION

### A. Reinforcing Steel Fabrication:

1. Fabricate in accordance with approved shop drawings, ACI 315 and Contract Documents.
2. Bending and Straightening: Except for #3 dowel bars will not be permitted after partial embedment in concrete.
3. Heating of Reinforcement: Will be permitted only with specific prior approval of the Authority.

4. Welding: Comply with ANSI/AWS D1.4; use E9018 electrodes or approved electrodes.
  5. Tolerances: Comply with ACI 117.
  6. Unacceptable Materials: Reinforcement with any of following defects will not be permitted in Work.
    - a. Bar lengths, depths, and bends exceeding ACI fabrication tolerances.
    - b. Bends or kinks not indicated on Drawings or final shop drawings.
    - c. Bars with reduced cross-section due to excessive rusting or other cause.
- B. Welded Wire Fabric:
1. Type: As fabricated in accordance with CRSI, unless otherwise noted.
- C. Templates:
1. Required for all footing and column dowels, and where required for proper alignment of reinforcing.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine the areas to receive the Work and the conditions under which the work will be performed. Contractor shall remedy conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.
- B. Surface condition, bending, spacing and tolerances of placement of reinforcement shall comply with the CRSI Manual of Standard Practice and ACI 301 and approved shop drawings. The Contractor shall be solely responsible for providing an adequate number of bars and maintaining the spacing and clearances shown on the approved shop drawings.
- C. Comply with applicable portions of Section 420.09 and 420.10 of Standard Specifications for Road and Bridge Construction, Illinois Department of Transportation.
- D. Prior to placing reinforcement, all grease, dirt, mortar and other foreign substances shall be removed from all surfaces of reinforcing.

### 3.02 PLACING REINFORCING BARS

- A. General: Install and place reinforcing in accordance with approved reinforcing placement shop drawings, in accordance with "Manual of Standard Practice" as published by the Concrete Reinforcing Steel Institute.
- B. Unless indicated otherwise, all reinforcing bars shall have at least 2 inches of protective concrete cover. Maintain the following surface clearance dimensions plus 1/4":
  1. Concrete cast against and permanently exposed to earth, 3 inches.
  2. Slabs on grade, 2 inches.
  3. Concrete surfaces in contact with water or exposed to weather, 2 inches.
  4. Concrete not exposed to earth, water or weather: 1 inch for slabs, 1 1/2" for beams and columns.
- C. Reinforcing bars shall extend 12 bar diameters but not less than 12" beyond bend unless noted otherwise.
- D. Support and secure reinforcing with accessories and epoxy coated tie wire to prevent displacement before and during concreting. Concrete shall not be poured if bars are not properly and securely placed with adequate supports.

- E. Reinforcement bars shall be supported, as specified herein, and their distances from faces of forms shall be maintained by means of approved blocks or epoxy coated ties, hangers, or other supports.
- F. Ties: Bars should be securely tied to prevent displacement during concreting operation with epoxy-coated tie wire, as required.
- G. All bar bends and hooks shall be in accordance with ACI 318 unless indicated otherwise on the drawings.
- H. No reinforcing steel bars shall be welded after being epoxy coated. No reinforcing steel bars shall be welded unless specifically shown on the Drawings, specified herein, or unless approved in writing by the Authority. All bars that have been welded, including tack welds, without such approval shall be immediately removed from the work. When welding of reinforcement is approved or called for, it shall comply with AWS D1.4.
- I. Reinforcing steel interfering with the location of other reinforcing steel, conduits, or embedded items may be moved within the specified tolerances or one bar diameter, whichever is greater. Greater displacement of bars to avoid interference shall only be made with the approval of the Authority. Do not cut reinforcement to install inserts, conduits, mechanical openings or other items without the prior approval of the Authority.
- J. Reinforcing steel bars shall not be field bent except where specifically authorized in writing by the Authority. If authorized, bars shall be cold-bent around the standard diameter spool specified in the CRSI. Attempt to bend without damaging the epoxy coating. Do not heat bars. Closely inspect the epoxy coating and reinforcing steel for breaks. If the epoxy coating or reinforcing steel is damaged, replace. Upon approval of the Authority, coated reinforcing steel bars that are field bent may have the damage to the epoxy coating repaired in accordance with the applicable ASTM Standard and applied per manufacturer's recommendations – a minimum of 7 mils dry film thickness shall be provided for repair. Do not bend reinforcement after it is embedded in concrete unless specifically shown otherwise on the Drawings
- K. When coated reinforcing steel bars are cut in the field, the ends of the bars shall be coated with the same material used for repair of coating damage.

### 3.03 REINFORCEMENT AROUND OPENINGS

- A. Unless specific additional reinforcement around openings is shown on the Drawings, provide additional reinforcing steel on each side of the opening equivalent to one half of the cross-sectional area of the reinforcing steel interrupted by an opening. Provide additional (2) #5's at mid slab depth at each corner of opening and at re-entrant corners. The additional bars shall have sufficient length to develop bond at each end beyond the opening or penetration.

### 3.04 ACCESSORIES

- A. Determine, provide and install epoxy coated accessories such as chairs, chair bars and the like in sufficient quantities and strength to adequately support the reinforcement and prevent its displacement during the erection of the reinforcement and the placement of concrete.
- B. Use precast concrete blocks where the reinforcing steel is to be supported over soil.
- C. Stainless steel bar supports or epoxy coated steel chairs with stainless steel tips shall be used where the chairs are set on forms for a concrete surface that will be exposed to weather or water. Use of plastic tipped metal chairs is permissible in all other locations unless otherwise noted on the Drawings or specified herein.

### 3.05 SPLICES

- A. Bar Splices: Bar splices shall be permitted only where shown on the drawings. Should the Contractor desire to splice bars at locations other than those shown on the drawings, written permission must be obtained from the Authority. Such splices shall be distributed or located at points of low tensile stress. Splices shall not be permitted unless a minimum of two inches can be provided between the spliced bar and the nearest adjacent bar. All splices for bars shall be made by use of a mechanical connector or by placing the bars in contact and wiring them together for the length of the splice.
- B. Lap Splices: All spliced bars shall have a minimum lap splice length as indicated on the drawings or longer as otherwise required by ACI standards or codes; ACI Standard Class B for Top/Bottom Bars. Where bars of different sizes lap, provide lap splice length for larger bar.
- C. Provide standard reinforcement splices by lapping ends, placing bars in contact, and wiring tightly together.
- D. Where dowels are indicated but not sized, provide dowels that match size and location of main reinforcement and lap splice with the main reinforcement.
- E. Welded wire fabric shall be lapped at least eight inches, or one wire space, whichever is greater, at ends and edges as well as wired together.

### 3.06 INSPECTION

- A. In no case shall any reinforcing steel be covered with concrete until the installation of the reinforcement, including the size, spacing and position of the reinforcement has been observed by the Authority and the Authority's release to proceed with the concreting has been obtained. The Authority shall be given ample prior notice of the readiness of placed reinforcement for observation. The forms shall be kept open until the Authority has finished observations of the reinforcing steel.
  - 1. If the reinforcement is not placed according to the tolerances noted herein, the Authority shall require the Contractor to reposition the reinforcing.
  - 2. All concrete placed in violation of this provision shall be rejected, removed and corrective work shall be at no cost to the Authority.
- B. General: The Contractor's Testing Agency shall test and inspect concrete reinforcement and embedded assemblies as Work progresses. Failure to detect any defective work or material shall not in any way prevent later rejection when such defect is discovered nor shall it obligate the Authority for final acceptance.

### 3.07 REPAIR OF REINFORCEMENT COATING

- A. General: Repair or remove and replace damaged epoxy coated reinforcing, as approved by the Authority.
- B. Repair of Epoxy Coating:
  - 1. Reinforcing steel with more than 2% of its coated surface area damaged in any given 1 ft. section will not be accepted approved with repairs.
  - 2. Reinforcing steel with less than 2% of its coated surface area damaged in any given 1 ft. section shall be repaired with a two-part epoxy material conforming to the requirements ASTM D3963. A minimum of 7 mill dry film thickness of repair coating shall be provided.
  - 3. Clean the surfaces and apply epoxy repair coating in accordance with coating

manufacturer's recommendations.

4. Coat the cut ends, welds and mechanical splice devices regardless of the dimensions or area of the affected surface.

END OF SECTION

SECTION 03 30 00  
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

- A. This Section specifies requirements for cast-in-place concrete. The work under this Section shall consist of furnishing all labor, materials, and equipment required to provide and install the cast-in-place concrete structures shown on the drawings and including formwork, joint filler, isolation joint, water stops, embedded items, vapor retarder, floor sealer and all other appurtenant work required to complete this work. The concrete work includes slabs on grade, structural slabs, concrete topping slab, concrete steps, concrete foundations, footings, piers and other concrete structures.
- B. Furnish all sampling and testing as required for qualification of proposed materials and establishment of design mixes and performing field testing of all concrete by a qualified testing laboratory acceptable to the Authority and engaged by and at the expense of the Contractor.
- C. Related Sections: The following sections contain requirements that relate to this Section.
  - 1. Section 01 45 23 - Testing and Inspection Service
  - 2. Section 31 20 00 - Earthwork
  - 3. Section 03 20 00 - Concrete Reinforcement
  - 4. Section 07 10 10 - Membrane Waterproofing

1.03 STANDARDS

- A. Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
  - 1. American Concrete Institute (ACI).
  - 2. American Society for Testing and Materials (ASTM).
  - 3. Illinois Department of Transportation (IDOT) Standard Specification for Road and Bridge Construction.
- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.
  - 1. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
  - 2. ASTM C33 - Standard Specification for Concrete Aggregates.
  - 3. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
  - 4. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
  - 5. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
  - 6. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.
  - 7. ASTM C150 - Standard Specification for Portland Cement.
  - 8. ASTM C156 - Standard Test Method for Water Retention by Concrete Curing Materials.
  - 9. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
  - 10. ASTM C172 - Practice for Sampling Freshly Mixed Concrete.
  - 11. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.



12. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
13. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
14. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
15. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
16. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
17. ASTM C979 - Color Pigment for Concrete.
18. ASTM C1064 - Test Method for Temperature of Freshly Mixed Portland Cement Concrete.
19. ACI 117, "Standard Tolerances for Concrete Construction and Materials."
20. ACI 211.1, "Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete."
21. ACI 301, "Specifications for Structural Concrete for Buildings."
22. ACI 304, "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete."
23. ACI 305, "Hot Weather Concreting."
24. ACI 306, "Cold Weather Concreting."
25. ACI 308, "Standard Practice for Curing Concrete."
26. ACI 309, "Standard Practice for Consolidation of Concrete."
27. ACI 318, "Building Code Requirements for Reinforced Concrete."
28. ACI 347, "Guide to Formwork for Concrete".

#### 1.04 SUBMITTALS

A. Submit the following, in accordance with Section 01 33 00, Submittals.:

1. Sources of cement and aggregates.
2. Material Safety Data Sheets (MSDS) for all concrete components and admixtures.
3. Air-entraining admixture. Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations, field testing methods and conformity to ASTM standards.
4. Water-reducing admixture (plasticizer). Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations and conformity to ASTM standards.
5. Accelerating/retarding admixtures. Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations and conformity to ASTM standards.
6. Concrete mix for each formulation of concrete proposed for use including constituent quantities per cubic yard, water-cementitious materials ratio, concrete slump, type and manufacturer of cement. The mix design shall be signed and sealed by either an Illinois Professional Engineer or Structural Engineer. The mix designs shall specify weight and type of Portland Cement, fine aggregate, coarse aggregate, brand names and amounts of chemical admixtures, range of water content, range of slump and expected compressive strength for seven, fourteen and twenty-eight days. Provide the following for each mix proposed. Results are to be no older than 1 year from date of concrete pour.
  - a. Compression test results for proposed mixes. Include standard deviation data for each proposed concrete mix based on statistical records where applicable.
  - b. Curve of water-cementitious materials ratio versus concrete cylinder strength for each formulation of concrete proposed based on laboratory tests. The cylinder strength shall be the average of the 28 day cylinder strength test results for each mix. Provide results of 7 and 14 day tests if available.
  - c. Fine aggregates – Test reports indicating conformity with ASTM standards, including sieve analysis, physical properties, and deleterious substance.
  - d. Coarse aggregates – Test reports indicating conformity with ASTM standards, including sieve analysis, physical properties, and deleterious substances.

- e. Cements – Test reports indicating conformity with ASTM standards, including chemical analysis and physical properties for type.
  - f. Contractor shall submit documentation from the concrete suppliers indicating previous experience with the proposed mix design.
- 7. Sheet curing material. Product data including catalogue cut, technical data and conformity to ASTM standard.
- 8. Liquid curing compound. Product data including catalogue cut, technical data, storage requirements, product life, application rate and conformity to ASTM standards. Identify proposed locations of use.
- 9. Concrete floor sealer product data, specifications and instructions for application.
- 10. Concrete stain product data, specifications and instructions for application.
  - a. Provide color charts for manufacturer's standard colors for Authority's selection and approval.
- B. The Contractor shall provide the following for review and obtain approval: product data for materials and items including forming materials and accessories, form release agents, admixtures, patching compounds, bonding agents, joint systems, curing compounds and others as requested. Certify that each admixture is compatible with others used.
- C. The Contractor shall submit formwork shop drawings and calculations for all structural concrete to the Authority for review. The shop drawings shall indicate the fabrication, erection and support procedures for the formwork. The formwork shop drawings and structural calculations for the design of the formwork and formwork support shall be signed and sealed by an Illinois licensed structural engineer. Show form construction including jointing, special form joints, location and pattern of form tie placement and other items that affect exposed concrete visually. The Contractor shall make modifications to the procedure if required, to obtain results that are satisfactory to the Authority, only after receiving approval in writing from the Authority. .
  - 1. Formwork design calculations are to have the following minimum requirements.
    - a. All loads applied on the formwork must be identified and must have a load path thru the structure to a suitable foundation. All elements in the load path must be designed and detailed.
    - b. Formwork to be designed per ACI 347-Guide to Formwork for Concrete.
    - c. Tie splices are to have equal or greater capacity than the tie rods, i.e. coil ties splices are not to be used.
    - d. Actual mix design needs to be used to calculate pressure on formwork.
    - e. Actual concrete temperature (or colder temperature to be conservative) needs to be used to calculate pressure on formwork.
    - f. Actual pour rate (or faster pour rate to be conservative) needs to be used to calculate pressure on formwork.
    - g. In such case that the formwork is a prefabricated unit that has limits to the pressures it can support, the SE should provide the contractor with a maximum pour rate (or lower pour rate if dictated by the contractor) based on conservatively assumed temperature and mix design. Formwork system then to be designed based on a pour rate agreed to between the IL SE and the contractor.
    - h. In such cases where formwork or accessories are proprietary, the design SE (or the independent SE as part of the independent review in part 4), as part of the calculation package shall provide documentation explaining that they have reviewed the analysis and/or testing verification done by the manufacturer and understand that they, by signing and sealing the calculation package with the proprietary products, are liable for any failures.

2. Formwork shop drawings are to have the following minimum requirements.
  - a. They are to match the formwork calculations.
  - b. Accessories not supplied by the formwork supplier and expected to be supplied by the Contractor need to be identified as such and called out with a product manufacturer, name and part number, or other such material specifications, to ensure the contractor purchases the same product that was designed by the formwork design Structural Engineer.
  - c. Overlay rebar shop drawing information and other adjacent construction information at locations of potential conflict and coordinate a solution.
  - d. If directly adjacent to tracks or road, show section to verify clearance with trains and/or vehicle traffic.
  - e. Comply with Section 3.02.
3. The Contractor shall submit product data sheets, material certifications, etc. for accessories noted on the formwork shop drawings as not being supplied by the formwork supplier.
4. Formwork design calculations, shop drawings and product data submittals to be reviewed by an Independent Structural Engineer, hired by the Contractor, and the review process is to have the following minimum requirements.
  - a. The Independent Structural Engineer reviewer, as a minimum, is to review the formwork calculations and shop drawings to ensure the formwork design Structural Engineer has addressed the minimum requirements for shop drawings and calculations as noted herein.
  - b. Formwork design Structural Engineer and Independent Structural Engineer to coordinate and come to a resolution on disagreements.
  - c. Once formwork design Structural Engineer and Independent Structural Engineer come to resolution on all disagreements, a final set of formwork shop drawings and calculations signed and sealed by the formwork design Structural Engineer are to be issued for construction to the Authority along with a signed and sealed letter from the Independent Structural Engineer noting that all of their concerns have been addressed with an attachment of itemized comments and resolution actions.
- D. Provide material certificates in lieu of material laboratory test reports, when permitted. Certificates shall be signed by the manufacturer and Contractor, certifying that each material item complies with or exceeds specified requirements.
- E. Provide delivery tickets for all ready-mixed concrete. Tickets to include the following information:
  1. Significant times during the process such as start load, end load, leave plant, arrive job, begin pour, and end pour.
  2. Date
  3. Truck number
  4. Driver number
  5. total yards in truck
  6. total yards for order
  7. plant location
  8. delivery location
  9. mix number
  10. other items added to the mix prior to loading, during loading or after loading not already indicated in the approved mix design, including when it was added.

- F. Provide batch reports for all ready-mixed concrete. Tickets to include the following information:
1. Significant times during the process such as batch time, start load, end load.
  2. Date
  3. Truck number
  4. Driver number
  5. total yards in load
  6. plant location
  7. delivery location
  8. mix number
  9. Description of all ingredients
  10. Design quantities of all ingredients
  11. Actual quantities of all ingredients
  12. total weight of load
  13. Design w/c ratio
  - 14 Actual w/c ratio
  15. Percent moisture of aggregates
- G. Provide product data, specifications, installation instructions, samples, shop drawings showing locations and installation details and other information for the following:
1. Water stops.
  2. Joint filler and isolation joint materials.
  3. Vapor retarder.
- H. Provide bonding agent product data including catalog cut, technical data and installation directions and recommendations.
- I. Provide compatibility test results between adjacent sealants and curing and sealing materials.
- J. As-Built requirements: Pursuant to Division One Section, Closeout Procedures, provide as-built drawings indicating actual locations and elevations of all foundations, foundation elements, openings and other features upon completion of the project.
- K. Provide two copies of test reports from the Contractor's testing agency verifying concrete strength.
- L. The Contractor shall submit a process plan for forming, placing, finishing and curing of all concrete to the Authority for review and approval. At a minimum, the process plan is to include the following:
1. A copy of all submittals associated with the process.
  2. A copy of all checklists as noted in Section 3.13.

#### 1.05 QUALITY ASSURANCE

- A. Reinforced concrete shall comply with the latest ACI codes: ACI 301, Specification for Structural Concrete; ACI 304, Guide for Measuring, Mixing, Transporting, and Placing Concrete; ACI 311, ACI Concrete Inspection Manual; ACI 315, ACI Detailing Manual; ACI 318, Building Code and Commentary; and ACI 347, Guide to Formwork for Concrete. The most stringent requirement of the codes, standards, building codes and this Section shall apply when conflicts exist.
- B. Only one source of cement and aggregates shall be used on any one structure. Concrete shall be uniform in color and appearance.
- C. Testing of the following materials shall be furnished by Contractor to verify conformity with this Specification Section and the stated ASTM Standards.

1. Fine aggregates for conformity with ASTM C33 - sieve analysis, physical properties, and deleterious substances.
  2. Coarse aggregates for conformity with ASTM C33 - sieve analysis, physical properties, and deleterious substances.
  3. Cements for conformity with ASTM C150 - chemical analysis and physical properties.
  4. Pozzolans for conformity with ASTM C618 - chemical analysis and physical properties.
- D. Proportion mixes by either laboratory trial batch or field experience methods, using materials to be employed on the job for each type of concrete required, in compliance with ACI 318 (Chapter 4). In addition, documentation shall be provided demonstrating that the proposed concrete proportions will produce an average compressive strength at least 15% higher than the herein specified compressive strengths.
- E. Use ready-mix concrete, complying with ASTM C94 and supplied by a ready-mix source which is inspected yearly by the Illinois Department of Transportation. Delivery tickets shall note the mix designation, admixtures, time dispatched, date, project number and Contractor and shall be submitted for review by the Authority.
- F. Testing: Contractor shall arrange for and pay for an independent testing laboratory, approved by the Authority, to perform the following tests; providing a copy of all reports to the Authority for approval:
1. Concrete sampling for design mix, air content and slump.
  2. Concrete cylinders for 7, 14, and 28 day compression strength.
  3. Backfill compaction testing.
  4. Conduct specified Source Quality Control and Field Quality Control and submit reports for all concrete work.
- G. Provide quality assurance according to Section 1020 of the IDOT Standard Specifications.
- H. See also Section 01 45 80, Testing and Inspection Service.

#### 1.06 PROJECT CONDITIONS

- A. Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting concrete performance.
- B. Principal opening sizes and locations are indicated on the drawings. Additional smaller openings and sleeves may be required by other disciplines and shall be constructed according to details submitted to the Authority for approval.

#### 1.07 COORDINATION

- A. Coordinate work of this section with other subcontractors to verify required dimensions and locations including for inserts, anchors, anchor bolts, plates, conduit, and other items to be embedded in the concrete or installed with the concrete.
- B. Coordinate the delivery of embedded items or items to be installed with the concrete so as to avoid delays to the installation of the new concrete work.

#### 1.08 DELIVERY, STORAGE AND HANDLING

- A. Cement: Store weathertight to provide protection from dampness and contamination.
- B. Aggregate: Arrange and use stockpiles to avoid excessive segregation or contamination with other materials or with other sizes of like aggregates. Do not use frozen or partially frozen aggregate.

- C. Sand: Arrange and use stockpiles to avoid contamination. Allow sand to drain to a uniform moisture content before using. Do not use frozen or partially frozen sand.
- D. Admixtures: Store in closed containers to avoid contamination, evaporation or damage. Provide suitable agitating equipment to assure uniform dispersion of ingredients in admixture solutions which tend to separate. Protect liquid admixtures from freezing and other temperature changes which could adversely affect their characteristics.
- E. Sheet Curing Materials: Store in weathertight buildings or off the ground and under cover.
- F. Liquid Curing Compounds: Store in closed containers.
- G. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

## PART 2 PRODUCTS

### 2.01 CLASS SI CONCRETE

- A. All concrete defined by this specification shall be Class SI Concrete having a compressive strength as shown on the drawings, or if not shown, as indicated herein, and conform to the requirements of Sections 503 and 1020 of the IDOT Standard Specifications.
- B. Cement: Domestic Portland cement, Type I or II (Type III used only when high early strength is needed and as approved by CTA), complying with ASTM C150.
- C. Fine Aggregate: Washed inert natural sand conforming to the requirements of ASTM C33.
- D. Coarse Aggregate: Maximum size aggregate shall be  $\frac{3}{4}$  inch. Well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33. Grading requirements shall be as listed in ASTM C33 for the specified coarse aggregate size number.
- E. Water: Potable water free from injurious amounts of oils, acids, alkalis, salts, organic matter, or other deleterious substances.
- F. Admixtures: Admixtures shall be free of chlorides and alkalis (except for those attributable to water). Each admixture shall be compatible with all of the components in the concrete mix and shall be suitable when it is required to use more than one admixture in a concrete mix. Admixtures shall be compatible with the concrete mix including other admixtures potable water after 30 days.
  - 1. Air-Entraining Admixture: The admixture shall comply with ASTM C260. Proportioning and mixing shall be in accordance with manufacturer's recommendations.
  - 2. Water-Reducing Agent: The admixture shall comply with ASTM C494, Type A. Proportioning and mixing shall be in accordance with manufacturer's recommendations.
  - 3. Admixtures causing retarded or accelerated setting of concrete shall not be used without written approval from the Authority. When allowed, the admixtures shall be retarding or accelerating water reducing or high range water reducing admixtures.
- G. The use of calcium chloride and other chloride containing agents is prohibited.
- H. Sheet Curing Materials: Waterproof paper, polyethylene film or white burlap-polyethylene sheeting all complying with ASTM C171.
- I. Liquid Curing Compound: Liquid membrane-forming curing compound shall comply with the requirements of ASTM C309, Type 1-D (clear or translucent with fugitive dye) and shall contain no wax, paraffin, or oil. Curing compounds shall have a minimum of 18 percent solids, be non-

yellowing and have a unit moisture loss no greater than 0.55 kg/m<sup>2</sup> in 72 hours as measured by ASTM C156.

- J. Concrete Sealer: Water based, odorless, colorless; that penetrates, hardens and densifies concrete surfaces and leaves a nondarkening film that protects the concrete surface from oil, water, grease, dirt and other contaminant penetration. Sealer must be compatible with any concrete admixtures, color stains, curing compounds, hardeners, and any other concrete treatments used. Sealer must meet current local VOC restrictions and be non-flammable.
  - 1. Concrete sealer to be Hydrozo 100 Plus as manufactured by BASF Chemical Company or a sealer with similar characteristics. Manufacturers of concrete sealers that may be used for this project include, but not limited to, the following:
    - a. BASF.
    - b. ChemMasters.
    - c. Custm Building Products, Aqua Mix Sealer's Choice Gold.
    - d. SpecChem.
    - e. TK Products.
    - f. H & C Concrete Coatings.
    - g. Approved Equal.

## 2.02 MIXES

- A. Select proportions of ingredients to meet the design strength and materials limits specified and to produce concrete having proper placability, durability, strength, appearance and other required properties. Proportion ingredients to produce a homogenous mixture which will readily work into corners and angles of forms and around reinforcement without permitting materials to segregate or allowing excessive free water to collect on the surface.
- B. Slump of the concrete shall be as measured by ASTM C143. If a high-range water reducer (plasticizer) is used, the slump indicated shall be that measured before plasticizer is added. Plasticized concrete shall have a slump ranging from 6- to 8-in.
- C. Proportion admixtures according to the manufacturer's recommendations. Two or more admixtures specified may be used in the same mix provided that the admixtures in combination retain full efficiency and have no deleterious effect on the concrete or on the properties of each other.
- D. Design mixes, when tested according to ASTM C 330, to be as indicated on the drawings, or if not indicated, provide normal weight structural concrete with 4000 psi at 28-day compressive strength, 0.44 maximum water-cement ratio for non-air-entrained concrete and 0.40 maximum for air-entrained concrete.
- E. Slump Limits for Normal Weight Concrete: Proportion and design mixes to result in a concrete slump at point of placement of 4" to 6"; with superplasticizer the maximum concrete slump at point of deposit to be 6" to 8",
- G. Normal weight aggregates to conform to ASTM C 33 unless specified otherwise. Maximum aggregate size to be 3/4 inch.
- H. Air Entraining Admixture: ASTM C 260; provide for exterior exposed concrete and as otherwise required: 4-7%.
- I. Water Reducing Admixture (Superplasticizer): ASTM C 494; provide for exterior exposed concrete and concrete with a water-cement ratio of 0.50 or less. Type as specified or approved by Authority. Type "A" water-reducing admixture, added in compliance with the manufacturer's recommendations - with no reduction in the specified cement content. (Type "D" water-reducing

admixture may be used in lieu of Type "A" during hot weather concreting).

- J. Admixtures containing chlorides shall not be used in the concrete.
- K. Fly ash shall be used conforming to Sections 1010 and 1020.05 of the IDOT Standard Specifications. When used, the fly content shall be no less than 15 percent nor more than 25 percent of the total cement, by weight
- L. Adjustments to Concrete Mixes: Mix design adjustments may be requested when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by the Authority. Laboratory test data for revised mix design and strength results must be submitted to and accepted by the Authority.
- M. No other admixtures shall be added without written approval from the Authority. The use of calcium chloride and other chloride containing agents is prohibited. Additives such as accelerators, retarders, anti washout agents (AWA) may be used if approved by the Authority.
- N. Concrete Stain: Apply stain to concrete after installation of slab according to stain manufacturer's written instructions and to create results in hardened concrete color consistent with approved mockup.

## 2.03 READY MIXED CONCRETE

- A. Provide ready mixed concrete in accordance with ASTM C94 and as specified. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.
  - 1. If an approved high-range water-reducer (plasticizer) is used to produce plasticized concrete, the maximum time interval shall not exceed 90 minutes.
  - 2. Do not use concrete in the work if it undergoes initial set or is not deposited within 90 minutes after the water is introduced. Do not add water to unworkable concrete at delivery end unless the testing laboratory accepts the procedure.
- B. Provide an official ticket for each ready mix truck delivery indicating all pertinent data for that load.

## 2.04 FORMWORK MATERIAL

- A. General: Forms to provide continuous, straight, smooth, exposed surfaces. Furnish forms in largest practicable sizes to minimize number of joints.
- B. Wood Forms:
  - 1. Finish No. 1 (for concealed below-grade concrete) exterior plywood B-B concrete form Class II PS-1-74.
  - 2. Finish No. 2 (for smooth exposed concrete) exterior type, resin coated plywood, high density concrete form overlay, Class I, PS-I-74.
- C. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide units that will leave no metal closer than 1-1/2 inches to the plane of the exposed concrete surface. Provide ties that, when removed, will leave holes not larger than 1 inch in diameter in the concrete surface.
- D. Form release agent: A non-staining form release agent shall be used on all form work. Form release agent used shall not damage form liner.

## 2.05 WATERSTOP



- A. Waterstop to be one of the following as shown on the drawings or as selected by the Authority,
- B. Flexible Rubber Waterstops: CE CRD-C 513,] for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
  - 1. Profile: Flat dumbbell with center bulb, Flat dumbbell without center bulb, Ribbed with center bulb, Ribbed without center bulb or as indicated.
  - 2. Dimensions: 4 inches by 3/16 inch thick, 6 inches by 3/8 inch thick or 9 inches by 3/8 inch thick; nontapered.
- C. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstops, for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals. Factory fabricate corners, intersections, and directional changes.
  - 1. Profile: Flat dumbbell with center bulb, Flat dumbbell without center bulb, Ribbed with center bulb, Ribbed without center bulb or as indicated.
  - 2. Dimensions: 4 inches by 3/16 inch thick, 6 inches by 3/16 inch thick, 6 inches by 3/8 inch thick, 9 inches by 3/16 inch thick or 9 inches by 3/8 inch thick; nontapered.
- D. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
  - 1. Profile: Flat dumbbell with center bulb, Flat dumbbell without center bulb, Ribbed with center bulb, Ribbed without center bulb or as indicated.
  - 2. Dimensions: 4 inches by 3/16 inch thick, 6 inches by 3/8 inch thick, 9 inches by 3/8 inch thick; nontapered.
- E. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch .
- F. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer-modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch.
- G. Manufacturers, provide a waterstop manufactured by one of the following, subject to the requirements specified herein:
  - 1. Durajoint.
  - 2. JP Specialties, Inc.
  - 3. Sika Greenstreak, Inc.
  - 4. Warco.
  - 5. Williams Products, Inc.
  - 6. Approved equal.

## 2.06 JOINT FILLER

- A. Expansion Joint Filler: Bituminous preformed joint filler conforming to ASTM D 1751. Strips to be full depth of concrete and 3/4" thick unless noted otherwise.

## 2.07 ISOLATION JOINT

- A. Isolation joints are to be ½ inch wide.
- B. Isolation joint material to be BASF expansion joint filler and Sonolastic SL-2 (or approved equal).

## 2.08 REINFORCING MATERIALS

- A. Refer to Section 03 20 00, Concrete Reinforcement, of these specifications for concrete reinforcing materials.

## 2.09 RELATED MATERIALS

- A. Vapor Retarder: Provide vapor retarder that is resistant to deterioration when tested according to ASTM E154 such as polyethylene sheet not less than 6 mils thick.
- B. Curing and Sealing Compounds: Clear concrete curing and surface sealing compound complying with ASTM C309, Type I, Class A; water-based acrylic coating.
- C. Latex Bonding Agent: Provide Bonding Agent per manufacturer's recommendations when placing new cast-in-place concrete against existing concrete. Bonding Agent shall comply with ASTM C1059, Type 11 – exterior use.
- D. Insulation: Extruded Polystyrene Board Insulation: Rigid cellular polystyrene thermal insulation with closed cells and integral high-density skin, formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578, Type IV; in manufacturer's standard lengths and widths; thicknesses as indicated on drawings, or if not indicated, 1 ½".
  - 1. Adhesive: Type recommended by insulation board manufacturer for application indicated.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Determine that subgrades, excavations, and other surfaces where concrete is to be placed are of proper bearing capacity, of solid material, undisturbed, of proper compaction if filled.
- B. Determine that excavations are of proper size, at proper depth, and properly located.
- C. Excavations and subgrades where concrete is to be placed must be clean and dry.

### 3.02 FORMS

- A. Forms shall be constructed so that the completed concrete structures conform to the shape, lines and dimensions of the members as shown on the Drawings, within tolerances allowed by the Standard Specifications. They shall be properly braced or tied together to maintain position and shape. Forms shall be made sufficiently tight to prevent leakage of mortar. Provide for openings, offsets, recesses, chamfers, blocking, anchorages, inserts and other features required in the work. Provide for thickened slabs where shown or required of proper width and depth and provide required recesses in the slab.
- B. Provide openings in concrete formwork to accommodate work of other trades. Coordinate with all other trades.
- C. Forms and adjacent surfaces to receive concrete to be clean and free of old concrete, grease and debris.
- D. The formwork shall be removed when the concrete is strong enough to withstand any applied forces and permission has been obtained from the Authority.

- E. Form ties shall be non-exposed cone type and shall be spaced as shown on the drawings or as approved by the Authority. All cones shall be filled with concrete after removal of the formwork.
- F. The Contractor is required to use a surveyor to properly locate the formwork, including elevations.
- G. The Contractor shall use smooth surfaced forms with tight joints for any concrete work that will remain exposed to view, either partially or fully; as determined prior to installation of the forms.

### 3.03 PLACING REINFORCEMENT

- A. See Section 03 20 00, Concrete Reinforcement. Reinforcement to be clean and free of rust, scale, dirt, and ice. Accurately position, support, and secure reinforcement. Place reinforcement to maintain minimum coverages for concrete protection. Install bars and welded fabric in longest lengths practicable, lapping at all splices. Offset laps to prevent continuous laps in either direction.
- B. Reinforcement shall have the following minimum cover, unless noted otherwise:
  - 1. Surfaces not formed: 3 inches.
  - 2. Formed surfaces in contact with soil or water: 3 inches.
  - 3. Formed surfaces not in contact with soil or water: 2 inches.
- C. Corner bars matching interior and exterior wall face horizontal bars shall be provided at all wall intersections. See drawings.
- D. Grouted reinforcing anchors shall be Hilti HY-150 Max. Adhesive or an equal system approved by the Authority.
- E. The Contractor is to notify the Authority when reinforcement bars are installed. Placement of concrete shall not commence until the Authority has inspected and approved the reinforcement placement.

### 3.04 JOINTS

- A. Construction Joints: Locate and install construction joints as shown on the drawings or so they do not impair the strength or appearance of the structure, as acceptable to the Authority.
- B. Provide keyways at least 1-1/2 inches deep in construction joints between walls and footings. Bulkheads designed and accepted for this purpose may be used for slabs.
- C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as indicated otherwise. Do not continue reinforcement through sides of strip placements.
- D. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.
- E. Isolation joints between new concrete and existing concrete, shall be filled with a premolded joint filler and sealing compound.
- F. Only those construction joints shown on the drawings will be allowed unless approved otherwise by the Authority.
- G. Control Joints. Depth to be T/4, min 1", spaced at 15' o.c. max. with a max aspect ratio of 1.5:1, unless otherwise noted on the drawings.

### 3.05 EXPANSION JOINTS

- A. Provide expansion joints at all intersections with other slabs, at existing elements, vertical

surfaces, at abutments with other structures, and at other locations where indicated or required. Expansion joints to be 3/4" unless noted otherwise. Expansion joints to be continuous and for the full depth of the concrete except for space for sealant.

### 3.06 ISOLATION JOINTS

- A. Provide isolation joints where shown or required. Isolation joints to be 1/2" unless noted otherwise. Isolation joints to be continuous and for the full depth of the concrete except for a 1/4" space for sealant.

### 3.07 WATERSTOPS

- A. Install waterstops where shown or required to form a continuous diaphragm. Install in longest lengths practical. Support and protect exposed waterstops during progress of the work. Field fabricate joints in waterstops by sealing according to manufacturer's written instructions.
- B. Waterstops shall be secured in place by splitting the concrete form. The center bulb shall be centered in the joint. While concrete is being placed the concrete shall be thoroughly vibrated to insure complete embedment of the ribbed flanges.

### 3.08 VAPOR RETARDER

- A. Place vapor retarder under concrete slabs and other at- or below-grade applications. Use largest available sheets. Overlap edges and seal as recommended by manufacturer.

### 3.09 INSTALLING EMBEDDED ITEMS

- A. General: Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.
- B. All exposed concrete corners shall be broken with a 3/4" x 3/4" chamfer or should match existing or adjacent work.
- C. Place steel plates, angles, anchor bolts, plate and nelson stud assemblies, etc. as shown into concrete before it sets. Position embedded anchor bolts using templates.
- D. Unless otherwise shown or approved, conduits and pipes embedded within a slab, wall or beam shall have a maximum outside dimension no greater than one third the overall thickness of the slab, wall or beam; and spacing shall be greater than or equal to three diameters or widths on center.
- E. Provide continuous water stops at each construction joint of any concrete element exposed to soil or water below grade. Provide a 1 1/2 inch by 3 1/2 inch continuous key at each joint requiring water stops.
- F. Electrical and communication conduits shall not be placed in concrete without prior approval by the Authority.

### 3.10 PREPARING FORM SURFACES

- A. General: Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form-coating compound before placing reinforcement.
- B. Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.

- C. All exposed concrete edges shall have a  $\frac{3}{4}$  inch chamfer.

### 3.11 MEASURING MATERIALS

- A. Concrete shall be composed of portland cement, fine aggregate, coarse aggregate, water and admixtures as specified and shall be produced by a concrete mixing plant acceptable to the Authority. All constituents, including admixtures, shall be batched at the plant.
- B. Measure materials for batching concrete by weighing in conformity with and within the tolerances given in ASTM C94 except as otherwise specified.
- C. Measure the amount of free water in fine aggregates within 0.3 percent with a moisture meter. Compensate for varying moisture contents of fine aggregates. Record the number of gallons of water as-batched on printed batching tickets.

### 3.12 MIXING AND TRANSPORTING

- A. Concrete shall be ready-mixed concrete; no hand-mixing will be permitted. Clean each transit mix truck drum and reverse drum rotation before the truck proceeds under the batching plant. Equip each transit-mix truck with a continuous, nonreversible, revolution counter showing the number of revolutions at mixing speeds.
- B. Ready-mix concrete shall be transported to the site in watertight agitator or mixer trucks loaded not in excess of their rated capacities as stated on the name plate.
- C. Keep the water tank valve on each transit truck locked at all times. Any addition of water must be directed by the Authority. Added water shall be incorporated by additional mixing of at least 35 revolutions. All added water shall be metered and the amount of water added shall be shown on each delivery ticket.
- D. All central plant and rolling stock equipment and methods shall comply with ACI 318 and ASTM C94.
- E. Select equipment of size and design to ensure continuous flow of concrete at the delivery end. Metal or metal-lined non-aluminum discharge chutes shall be used and shall have slopes not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20 feet long and chutes not meeting slope requirements may be used if concrete is discharged into a hopper before distribution.
- F. Retempering (mixing with or without additional cement, aggregate, or water) of concrete or mortar which has reached initial set will not be permitted.
- G. Handle concrete from mixer to placement as quickly as practicable while providing concrete of required quality in the placement area. Dispatch trucks from the batching plant so they arrive at the work site just before the concrete is required, thus avoiding excessive mixing of concrete while waiting or delays in placing successive layers of concrete in the forms.
- H. Furnish a delivery ticket for ready mixed concrete to the Authority as each truck arrives. Each ticket shall provide a printed record of the weight of cement and each aggregate as batched individually. Use the type of indicator that returns to zero after a batch is discharged. Clearly indicate the weight of fine and coarse aggregate, cement and water in each batch, the quantity delivered, the time any water is added, and the numerical sequence of the delivery. Show the time of day batched and time of discharge from the truck. Indicate the number of revolutions of the truck mixer.
- I. Temperature and Mixing Time Control:

1. In cold weather, do not allow the as-mixed temperature of the concrete and concrete temperatures at the time of placement in the forms to drop below 40 degrees F.
  2. If water or aggregate has been heated, combine water with aggregate in the mixer before cement is added. Do not add cement to mixtures of water and aggregate when the temperature of the mixture is greater than 90 degrees F.
  3. In hot weather, cool ingredients before mixing to maintain temperature of the concrete below the maximum placing temperature of 90 degrees F. If necessary, substitute well-crushed ice for all or part of the mixing water.
- J. The maximum time interval between the addition of mixing water and/or cement to the batch and the placing of concrete in the forms with concrete agitated shall not exceed the following:
1. If the air or concrete temperature (whichever is higher) is between 80 to 90 Degree F, the maximum time shall not exceed 45 minutes.
  2. If the air or concrete temperature (whichever is higher) is between 70 to 79 Degree F, the maximum time shall not exceed 60 minutes.
  3. If the air or concrete temperature (whichever is higher) is between 40 to 69 Degree F, the maximum time shall not exceed 90 minutes.
- If an approved high-range water-reducer (plasticizer) is used to produce plasticized concrete, the maximum time interval shall not exceed 90 minutes.
- K. Concrete Stain: Apply concrete stain to installed cured concrete according to manufacturer's written instructions for areas to receive stained concrete. Verify locations for color concrete. Concrete to be stained to be clean, dry and cured. Mix stain and apply as directed by manufacturer. Follow manufacturer's recommendations for installation

### 3.13 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work. Concrete shall not be placed until Contractor and Construction Manager complete each of their checklists.
1. Formwork inspection check list to have the following minimum requirements.
    - i. Formwork is installed per most recent shop drawings and Section 3.02..
    - ii. If formwork was modified, verify it was approved by formwork design SE and 3<sup>rd</sup> party SE.
    - iii. Concrete temperature is at or above design temperature.
    - iv. Concrete crew is to be notified of the maximum pour rate that is allowed per design.
    - v. Concrete mix being used matches design mix.
    - vi. Verify maximum pour rate is not exceeded.
  2. Concrete inspection check list to have the following minimum requirements:
    - i. Rebar sizes and quantities are verified with most recently approved shops.
    - ii. Rebar spacing, clearances and concrete cover is verified with most recently approved shop drawings and design drawings.
    - iii. All defects in epoxy coating have been repaired per specifications.
    - iv. All steel and miscellaneous structural embeds are verified installed per most recently approved shop drawings and design drawings.
    - v. All MEP and all other non-structural embeds are verified installed per most recently approved shop drawings and design drawings.

- vi. Verify that dowels extending out of formwork will not interfere with future work, i.e., pipe sleeves or other formwork.
  - vii. Hot/cold weather measures are in place per specifications.
  - viii. Verify all items inside of pour area are supported adequately to avoid displacement during concrete placement.
  - ix. Equipment and accessories are in place for proper finishing, curing and jointing.
- B. No concrete shall be placed without 24-hour advance notice to the Authority nor before the formwork and setting of reinforcement has been inspected and approved by the Authority.
- C. General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified.
- D. Verify that all formwork completely encloses concrete to be placed and is securely braced prior to concrete placement. Remove ice, excess water, dirt and other foreign materials from forms and exposed concrete joints. Voids in sleeves, inserts, etc., shall be filled temporarily with readily removable material to prevent entry of concrete. Confirm that reinforcement and other embedded items are securely in place. Have a competent workman at the location of the placement who can assure that reinforcing steel and embedded items remain in designated locations while concrete is being placed. Sprinkle semi-porous subgrades or forms to eliminate suction of water from the mix. Seal extremely porous subgrades in an approved manner.
- E. Deposit concrete as near its final position as possible to avoid segregation due to rehandling or flowing. Place concrete continuously at a rate which ensures the concrete is being integrated with fresh plastic concrete. Do not deposit concrete which has partially hardened or has been contaminated by foreign materials or on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within the section. If the section cannot be placed continuously, place construction joints as specified or as approved.
- F. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
  - 1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.
  - 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.
- G. Pumping of concrete will be permitted. Use a mix design and aggregate sizes suitable for pumping and submit for approval.
- H. Remove temporary spreaders from forms when the spreader is no longer useful. Temporary spreaders may remain embedded in concrete only when made of galvanized metal or concrete and if prior approval has been obtained.
- I. Do not place concrete for supported elements until concrete previously placed in the supporting element (columns, slabs and/or walls) has reached adequate strength.
- J. Where surface mortar is to form the base of a finish, especially surfaces designated to be painted, work coarse aggregate back from forms with a suitable tool to bring the full surface of the mortar against the form. Prevent the formation of excessive surface voids.

- K. All exposed concrete edges shall have a  $\frac{3}{4}$  inch chamfer.
- L. Provide concrete footings, walls, slabs, steps, pits, thickened slabs, piers for light poles and bollards, and other concrete installations as shown on the drawings. Form and provide for pockets for rails, trench drains, and drop concrete at doors as shown on the drawings. Provide dowels where new concrete meets existing as detailed on the drawings.

### 3.14 COLD WEATHER CONCRETING:

- A. "Cold weather" is defined as a period when for more than 3 successive days, the average daily outdoor temperature drops below 40 degrees F. The average daily temperature shall be calculated as the average of the highest and the lowest temperature during the period from midnight to midnight.
- B. Cold weather concreting shall conform to ACI 306.1 and with the applicable provisions of the Standard Specifications. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
- C. Discuss a cold weather work plan with the Authority. The discussion shall encompass the methods and procedures proposed for use during cold weather including the production, transportation, placement, protection, curing and temperature monitoring of the concrete. The procedures to be implemented upon abrupt changes in weather conditions or equipment failures shall also be discussed. Cold weather concreting shall not begin until the work plan is acceptable to the Authority.
- D. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
  - 1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  - 2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
- E. During periods of cold weather, concrete shall be protected to provide continuous warm, moist curing (with supplementary heat when required) for a total of at least 350 degree-days of curing.
  - 1. Degree-days are defined as the total number of 24 hour periods multiplied by the weighted average daily air temperature at the surface of the concrete (e.g., 5 days at an average 70 degrees F = 350 degree-days).
  - 2. To calculate the weighted average daily air temperature, sum hourly measurements of the air temperature in the shade at the surface of the concrete taking any measurement less than 50 degrees F as 0 degrees F. Divide the sum thus calculated by 24 to obtain the weighted average temperature for that day.
- F. Salt, manure or other chemicals shall not be used for protection.
- G. The protection period for concrete being water cured shall not be terminated during cold weather until at least 24 hours after water curing has been terminated.

### 3.15 HOT WEATHER CONCRETING

- A. "Hot weather" is defined as any combination of high air temperatures, low relative humidity and wind velocity which produces a rate of evaporation estimated in accordance with ACI 305R, approaching or exceeding 0.2 lbs/sqft/hr.



- B. Concrete placed during hot weather, shall be batched, delivered, placed, cured and protected in compliance with the recommendations of ACI 305 and the additional requirements specified herein.
- C. Temperature of concrete being placed shall not exceed 90 degrees F and every effort shall be made to maintain a uniform concrete mix temperature below this level. The temperature of the concrete shall be such that it will cause no difficulties from loss of slump, flash set or cold joints.
- D. All necessary precautions shall be taken to promptly deliver, to promptly place the concrete upon its arrival at the site and to provide vibration immediately after placement.
- E. The Authority may direct the Contractor to immediately cover plastic concrete with sheet material.
- F. Discuss with the Authority a work plan describing the methods and procedures proposed to use for concrete placement and curing during hot weather periods. Hot weather concreting shall not begin until the work plan is acceptable to the Authority.
- G. Hot-Weather Placement:
  - 1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  - 2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
  - 3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
  - 4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Authority.
- H. Do not apply unbalanced loads, such as hydrostatic pressure or backfill against structural components until the concrete has attained its design strength.

### 3.16 CONCRETE STAIRS

- A. Pitch stair treads and landings for drainage purposes. Use minimum slope of 0.1% without reducing the thickness of the stair slabs and landings.

### 3.17 SLABS

- A. After suitable bulkheads, screeds and jointing materials have been positioned, the concrete shall be placed continuously between construction joints beginning at a bulkhead, edge form, or corner. Each batch shall be placed into the edge of the previously placed concrete to avoid stone pockets and segregation.
- B. Avoid delays in casting. If there is a delay in casting, the concrete placed after the delay shall be thoroughly spaded and consolidated at the edge of that previously placed to avoid cold joints. Concrete shall then be brought to correct level and struck off with a straightedge. Bullfloats or darbies shall be used to smooth the surface, leaving it free of humps or hollows.
- C. Provide tape or other approved means to separate between concrete slab that is to be stained and concrete slab that is to remain natural. Lay out straight and even joints. Verify and set dimensions and locations for extent of stained concrete.
- D. All new slabs shall be placed on minimum 6" engineered fill compacted to 95% relative density.

### 3.18 COMPACTING FORMED CONCRETE

- A. Consolidate concrete by mechanical vibration, puddling, spading, rodding or forking so that concrete is thoroughly worked around reinforcement, embedded items and openings and into corners of forms. Puddling, spading, etc., shall be continuously performed along with vibration of the placement to eliminate air or stone pockets which may cause honeycombing, pitting or planes of weakness.
- B. Vibrators are to be used to consolidate properly placed concrete but shall not be used to move or transport concrete in the forms. Vibration shall continue until:
  - 1. Frequency returns to normal.
  - 2. Surface appears liquefied, flattened and glistening.
  - 3. Trapped air ceases to rise.
  - 4. Coarse aggregate has blended into surface, but has not disappeared.

### 3.19 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: Provide a rough-formed finish on formed concrete surfaces not exposed to view in the finished Work or concealed by other construction.
- B. Smooth-Formed Finish: Provide a smooth-formed finish on formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete. Repair and patch defective areas with fins and other projections completely removed and smoothed.

### 3.20 MONOLITHIC SLAB FINISHES

- A. Unless noted otherwise, concrete slabs to be 6" thick and reinforced with wire mesh. Provide vapor barrier under slab unless indicated otherwise.
- B. Pitch slabs to drains where drains are indicated without reducing the thickness of the slab. Minimum slope is 0.1%. Provide recesses or drop top of slab as required for finish floor materials. Verify locations.
- C. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified.
  - 1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared and concrete has sufficiently stiffened. Finish surfaces to tolerances of F(F) 18 (floor flatness) and F(L) 15 (floor levelness) measured according to ASTM E 1155. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
  - 2. Water is never to be added to surface of concrete to assist in finishing process.
- D. Trowel Finish: Apply a trowel finish to monolithic slab surfaces exposed to view.
  - 1. After floating, begin troweling operation, free of trowel marks, uniform in texture and appearance, and finish surfaces to tolerances of F(F) 20 (floor flatness) and F(L) 17 (floor levelness) measured according to ASTM E 1155. Grind smooth any surface defects.
- E. Nonslip Broom Finish: Apply a nonslip broom finish to concrete stair treads, ramps and elsewhere as indicated.
  - 1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route.
- F. Sawing of control joints shall commence as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling and no later than 12 hours after concrete is poured. All

joints shall be a minimum of one inch deep and sawed to the length shown on the drawing before uncontrolled shrinkage cracking takes place.

### 3.21 CONCRETE CURING AND PROTECTION

- A. Curing shall be in accordance with the applicable portions of Section 1020.13 of the IDOT Standard Specifications. Concrete floor slabs to be cured per IDOT Standard Specifications section 1020.13.a.5 for 3 days.
- B. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material.
- C. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
- D. Curing Methods: Cure concrete by curing compound, by moist curing, by moisture-retaining cover curing, or by combining these methods, as specified.
  - 1. Water Curing: Provide water curing by continuous water-fog spray or cover concrete surface with approved absorptive cover and thoroughly saturate cover with water. Begin wet cure as soon as concrete attains an initial set and maintain wet cure 24 hours a day for 3 continuous days
  - 2. Sheet Material Curing: Cover entire surface with sheet material. Securely anchor sheeting to prevent wind and air from lifting the sheeting or entrapping air under the sheet. Place and secure sheet as soon as initial concrete set occurs.
  - 3. Liquid Membrane Curing: Apply over the entire concrete surface except for surfaces to receive additional concrete. Curing compound shall NOT be placed on any concrete surface where additional concrete is to be placed, where concrete sealers or surface coatings are to be used, or where the concrete finish requires an integral floor product. Curing compound shall be applied as soon as the free water on the surface has disappeared and no water sheen is visible, but not after the concrete is dry or when the curing compound can be absorbed into the concrete. Application shall be in compliance with the manufacturer's recommendations. Apply curing compound on exposed interior slabs and on exterior slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation according to manufacturer's directions.
- E. Specified applications of curing methods.
  - 1. Slabs for Water Containment Structures and Chemical Spill Basins: Water curing only.
  - 2. Footings (not used to contain water): Water curing, sheet material curing or liquid membrane curing.
  - 3. Slabs on Grade and Structural Slabs (other than water containment): Water curing.
  - 4. Horizontal Surfaces which will Receive Additional Concrete, Coatings, Grout or Other Material that Requires Bond to the Substrate: Water curing.
  - 5. Formed Surfaces: None if nonabsorbent forms are left in place 7 days. Water cure if absorbent forms are used. Sheet cure or liquid membrane cure if forms are removed prior to 7 days.
  - 6. Concrete Joints: Water cured or sheet material cured.
- F. Finished surfaces and slabs shall be protected from the direct rays of the sun to prevent checking and crazing.
- G. The Contractor shall provide all necessary measures to prevent any water, frost or ice from penetrating the concrete prior to and after placement of concrete and until the concrete has obtained required strength.

### 3.21 REMOVING FORMS

- A. General: Formwork not supporting weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.
- B. Forms shall not be removed before the concrete has attained a strength of at least 30 percent of its specified design strength. Shores shall not be removed until the concrete has attained at least 60 percent of its specified design strength and also sufficient strength to support safely its own weight and construction live loads.

### 3.22 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to Authority.
- B. The external surface of all concrete shall be thoroughly worked during the operations of placing in such a manner as to work the mortar against the forms to produce a smooth finish free of honeycombs and with a minimum of water and air pockets.
- C. Depressions resulting from the removal of ties, and holes left by attachments to rod or bolt anchorages, shall be carefully and neatly pointed with a mortar of sand and cement mixed in the proportions used in the concrete.
- D. Air pockets or rough areas larger than 1/2 inch diameter occurring in any surface shall be pointed as specified in the foregoing paragraph. Honeycombed areas shall be chipped out by the Contractor and inspected by the Authority before being pointed. Pointed areas mentioned in this paragraph shall then be given a normal finish in accordance with the requirements of the Standard Specifications.
- E. As soon as the forms have been stripped and the concrete surfaces exposed, fins and other projections shall be removed; clean all exposed concrete surfaces and adjoining work stained by leakage of concrete, to approval of the Authority.
- F. When patching defects in exposed surfaces the same source of cement and sand as used in the parent concrete shall be employed. Adjust color if necessary by addition of proper amounts of white cement. Rub lightly with a fine Carborundum stone at an age of 1 to 5 days if necessary to bring the surface down with the parent concrete. Exercise care to avoid damaging or staining the virgin skin of the surrounding parent concrete. Wash thoroughly to remove all rubbed matter.

### 3.23 CONCRETE TOPPING

- A. Provide mix and color of concrete as directed, selected and approved. Color must match color selected and be uniform for the entire project and the entire thickness of the topping.
- B. Concrete slab to be covered with topping to be clean and dry. Surface of base slab to be rough or have a scratch surface for better bonding of topping.
- C. Apply bonding agent to base slab according to bonding agent's manufacturer's recommendations and directions. Apply bonding agent to any vertical surfaces that topping will abut and surfaces where topping is placed against hardened or partially hardened topping.
- D. Provide and install wire mesh reinforcing in concrete topping slab as shown or required. Provide type and sizes of mesh and wire size as shown or required. Provide proper concrete cover, overlap ends as required and secure into place to avoid displacement during pouring operations.

- E. Install concrete topping slab to limits indicated by lowered base slab. Float finish topping slab and trowel to a smooth, uniform, level finish and to the correct height. Finish surfaces to overall values of flatness of 25 and levelness of 20.
- F. Construct joints true to line with faces perpendicular to surface plane of topping.
- G. Form weakened-plane contraction joints with power saws, 1/8" wide, when cutting action will not tear, abrade, or otherwise damage surface and before topping develops random contraction cracks.
- H. Form joints in topping over contraction joints in base slabs, unless otherwise indicated. Provide joints in both directions as recommended to eliminate surface cracking.
  - 1. Construct contraction joints for a depth equal to one-half of topping thickness.
  - 2. Joints to be straight and parallel. Follow pattern shown on drawings or as otherwise dictated. Align with column lines or other structure elements. Do not exceed 15'-0" spacing in either direction for contraction joints.
- I. Protect freshly placed topping from premature drying and excessive cold or hot temperatures.
- J. Begin curing immediately after finishing topping, using one of the methods indicated above for curing other concrete: moisture curing, moisture-retaining-cover curing, or curing compound.

### 3.24 CONCRETE SEALER

- A. All exposed concrete slabs shall receive a coat of concrete sealer meeting requirements of IDOT Standard Specifications Article 1026, Concrete Sealer.
- B. Penetrating Liquid Floor Treatment: Prepare, apply and finish penetrating liquid floor treatment according to manufacturer's written instructions. Apply to all concrete floor slabs. Apply after concrete has been stained, where applicable, and stain has fully dried.
  - 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
  - 2. Do not apply to concrete that is less than seven days old.
  - 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry.
  - 4. Apply a second coat in a similar manner for floors to remain exposed or if the surface is rough or porous.

### 3.25 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. The Contractor will employ and pay for a testing laboratory to obtain sets of field control cylinder specimens during the progress of the work in compliance with ASTM C31, to perform tests and to submit test reports as directed by the Authority. See Section 01 45 23, Testing and Inspection Service. The number of sets of concrete test cylinders taken of each class of concrete placed each day shall not be less than one set per day, nor less than one set for each 150 cu yds of concrete nor less than one set for each 5,000 sq ft of surface area for slabs or walls.
  - 1. A "set" of test cylinders consists of four cylinders: one to be tested at 7 days and two to be tested and their strengths averaged at 28 days. The fourth may be used for a special test at 3 days or to verify strength after 28 days if 28-day test results are low.
  - 2. When the average 28-day compressive strength of the cylinders in any set falls below the specified design strength or below proportional minimum 7-day strengths (where proper relation between seven and 28-day strengths have been established by tests), proportions, water content, or temperature conditions shall be changed to achieve the required strengths.

- B. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
1. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed. If the slump is outside the specified range, the concrete shall be rejected.
  2. Air Content: Test for air content shall be made daily on fresh concrete samples using test method ASTM C 173, volumetric method for lightweight or normal weight concrete or ASTM C 231, pressure method for normal weight concrete.
  3. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 deg C) and below, when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
  4. Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
  5. Compressive-Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yd. plus additional sets for each 50 cu. yd. more than the first 25 cu. yd. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
  6. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the concrete.
  7. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.
- C. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Authority. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.
- D. Should the strengths shown by the test specimens made and tested in compliance with the previous provisions fall below the required strengths, the Authority shall have the right to require changes in proportions outlined to apply to the remainder of the work. Furthermore, the Authority shall have the right to require additional curing on those portions of the structure represented by the test specimens which failed. The cost of such additional curing shall be at the Contractor's expense. In the event that such additional curing does not give the strength required, as evidenced by core and/or load tests, the Authority shall have the right to require strengthening or replacement of those portions of the structure which fail to develop the required strength. The cost of all such core borings and/or load tests and any strengthening or concrete replacement required because strengths of test specimens are below that specified, shall be entirely at the expense of the Contractor. In such cases of failure to meet strength requirements the Contractor and Authority shall confer to determine what adjustment, if any, can be made in compliance with Sections titled "Strength" and "Failure to Meet Strength Requirements" of ASTM C94. The "purchaser" referred to in ASTM C94 is the Contractor in this Section.
- E. When the tests on control specimens of concrete fall below the specified strength, the Authority will order check tests for strengths to be made by means of typical cores drilled from the structure in compliance with ASTM C42 and C39. In the case of cores not indicating adequate strength, the Authority, in addition to other recourses, may require, at the Contractor's expense, load tests on any one of the concrete structures in which such concrete was used. Tests need not be made until concrete has aged 60 days.
- F. Compression Test Reports: In addition to reporting as outlined in ASTM C39, present the following data in tabular form and distribute after recording test results:
1. Identity of project, Contractor, supplier.

2. Identity of mix and required strength.
  3. Pour location of sampled concrete.
  4. Slump, air content, truck number, time and date sampled, air temperature, concrete temperature, consistency.
  5. Curing history.
  6. Date tested.
  7. Compressive strength.
  8. Type of fracture.
  9. Compliance with specification.
- G. At the Authority's direction, concrete shown by test not to meet the specified strength requirements shall be removed and replaced at no additional cost to the Authority.

END OF SECTION

SECTION 05 10 30  
STRUCTURAL STEEL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

- A. This Section specifies requirements for structural steel used in the project including columns, beams, canopy and roof framing, framing for new stair opening, framing for elevator shaft, framing for escalator opening and support, etc. This work includes furnishing all labor, materials, accessories, tools and equipment required to furnish and install all structural steel including, but not limited to, fabrication, galvanizing, field erection, field preparation for painting and any other work required for a complete project.
- B. Unless noted otherwise, all new structural steel must be hot-dip galvanized. Existing structural steel must be field prepared and cleaned and also coated with protective and finish coats in the field.
- C. Related Specifications
  - a. 05 01 31 Architecturally Exposed Structural Steel Framing
  - b. 05 10 37 Metal Roof Deck Repair
  - c. 05 31 00 Steel Deck
  - d. 05 50 00 Metal Fabrications
  - e. 05 50 10 Barriers High Barriers Gate
  - f. 05 50 20 Railing and Guardrails
  - g. 05 50 30 Cane Rails
  - h. 05 50 40 Metal Stairs with Cast Abrasive Treads
  - i. 05 51 00 Metal Stair System
  - j. 05 53 00 Metal Gratings
  - k. 05 53 10 Metal Roadway Grating
  - l. 05 71 00 Perforated Metal Panels
  - m. 05 72 30 Metal stair Tread and Nosing
  - n. 05 80 10 Elastomeric Expansion Assemblies Slide Bearing Assemblies Bearing Pads and Isolation Pads
  - o. 09 90 00 Painting
  - p. 09 90 10 Cleaning and Painting of Existing Surfaces

1.03 REFERENCES

- A. General
  - 1. American Society for Testing and Materials (ASTM)



- a. ASTM A6 “Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling”
- b. ASTM A36 “Standard Specification for Carbon Structural Steel”
- c. ASTM A572 “Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel”
- d. ASTM A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless”
- e. ASTM F3125 “Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi and 150 ksi Minimum Tensile Strength”
- f. ASTM F1554 “Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength”
- g. ASTM A123 “Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products”
- h. ASTM A153 “Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware”
- i. ASTM A780 “Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings”
- j. ASTM D6386 “Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting”
- k. ASTM D7803 “Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Powder Coating”
2. “Recommended Details for Hot-dip Galvanized Structures”, American Galvanizers Association
3. “Inspection of Products Hot-dip Galvanized After Fabrication”, American Galvanizers Association
4. “The Design of Products to be Hot-dip Galvanized After Fabrication”, American Galvanizers Association

#### B. Building and Facility Structures

1. American Society for Testing and Materials (ASTM)
  - a. ASTM A500 “Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes”
  - b. ASTM A992 “Standard Specification for Structural Steel Shapes”
  - c. ASTM A1085 “Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS)”
2. AISC 303 “Code of Standard Practice for Steel Buildings and Bridges”
3. AISC 360 “Specification for Structural Steel Buildings”
4. AWS D1.1 “Structural Welding Code”
5. “Specification for Structural Joints Using High-Strength Bolts” as approved by the Research Council on Structural Connections
6. “Handbook on Bolt, Nut, and Rivet Standards”, Industrial Fasteners Institute
7. AISC Design Guides

#### C. Bridges Structures

1. American Society for Testing and Materials (ASTM)
  - (a) ASTM A709 "Standard Specification for Structural Steel for Bridges"
2. Illinois Department of Transportation Standard Specification for Road and Bridge Construction, Section 505, and 1006 including the current Supplemental Specifications for these Sections and applicable Guide Bridge Special Provisions.
3. AWS D1.5 "Bridge Welding Code"

D. Track Structures

1. All references included in Section C.
2. American Railway Engineering and Maintenance of Way Association (AREMA) "Manual for Railway Engineering", Chapter 15, "Steel Structures", Parts 1, 3, 4 and 5.

1.04 SUBMITTALS

- A. Shop Drawings: Submit to the Authority in accordance with the requirements of the Submittal Section of these specifications, the following:
  1. Complete details and schedules for the fabrication of each member, and for shop assembly of members, including connections.
  2. Complete details, schedules, procedures and diagrams showing the sequence of erection.
  3. Complete shop drawings must indicate actual field-verified dimensions, elevations and details for all structural steel for this project. Shop drawings must identify the size, location and erection details of all structural steel, connections, and all other details.
- B. Connection Designs Delegated to the Fabricator: Furnish structural calculations with connection detail drawings for all structural steel and connections for the actual loading and conditions. Calculations must be prepared by and sealed by an Illinois licensed Structural Engineer. Prior to submitting shop drawings of these connections for review, the Structural Engineer of Record for the connections must review the shop drawings for compliance with their design.
- C. Manufacturer's Literature: Submit to the Authority, copies of manufacturer's specifications and installation instructions for the products being supplied as well as for the welding, galvanizing, and any shop applied coats of paint; including laboratory test reports and such other data as may be required to show compliance with these specifications and specified standards.
- D. Surveys: When new steel is connected to or installed adjacent to another fixed object, submit to the Authority, copies of signed and sealed survey(s) by the Contractor's Illinois licensed Professional Land Surveyor, showing elevations and locations of all pertinent existing fixed object elements. The shop drawings for the new steel will not be approved for fabrication until the survey is submitted and it is confirmed that the survey information has been integrated into the shop drawings.
- E. Mill Affidavits and Certifications: Prior to fabrication of Structural Steel, the Contractor must submit to the Authority the following certified reports for the steel for the permanent structure:
  1. Mill heat analysis of chemical composition.
  2. Tension, bend and notch toughness test reports.
  3. Mill certification that all supplementary requirements have been complied with.
  4. Certification that bolts meet all ASTM requirements for the grade specified.
  5. Certification that welding rods will deposit weld composition and amounts of silicone as close as possible to base metal.

- F. Submit weld procedures and welder qualifications for review and obtain approval prior to fabrication or erection for field welding.
- G. Provide letter from the galvanizer indicating that the approved shop drawings and fabrication processes have been reviewed and that there is nothing found that will prevent the hot dip galvanizer from meeting the requirements in the project documents
- H. Submit all proposed galvanizing repair work, including galvanizing repair material type and corresponding detailed repair procedure.
  - 1. Repair procedures must be per annex section for corresponding material repair type in ASTM A780 – refer to “Products” Part of this specification. Manufacturer’s detailed application procedures for repair material type may be used provided they conform to ASTM A780.
- I. Contractor must submit a letter confirming that the steel shop drawings have been coordinated with all other new and existing pertinent adjacent objects, including but not limited to new and existing CIP concrete, PC concrete and utilities.
- J. Contractor must submit process plans for all steel erection phases. Process plans to include, but are not limited to the following:
  - 1. Plans showing extent of work zone and equipment locations.
  - 2. Analysis of material picks for lifting equipment capacities.
  - 3. Special attention is to be paid to steel erected adjacent to active train traffic and traction power infrastructure. Coordination of these activities with CTA Safety and CTA Rail Operations is essential.
  - 4. All other requirements for process plans as listed in Division 1.
- K. Contractor must submit process plan for bolting and testing of slip critical connections and pretensioned bolts. The process plan must include a field demonstration by the erector and testing agency, witnessed by the Authority or the Authority’s designee prior to steel erection.

#### 1.05 QUALITY ASSURANCE

- A. The structural steel work required herein, including details, fabrication, inspection, testing, and erection, except as otherwise shown, must comply with the provisions of the codes, specifications and standards listed in both Section 1.03 A for all types of structure and Sections 1.03 B, C, and D for the specific individual type of structure.
- B. The Contractor is solely responsible for quality control of all the structural steel work. The Contractor must employ, at his own expense, a qualified Independent Testing Agency to conduct specified Source Quality Control and Field Quality Control and provide reports to the Authority. Information regarding the testing agency must be submitted to the Authority for approval prior to being hired by the Contractor.
- C. Contractor must comply with all applicable governmental codes and regulations.
- D. Galvanize Coating Applicator’s Qualifications: Company specializing in hot dip galvanizing after fabrication and following the procedures of “Quality Assurance Manual” of the American Galvanizers Association.
- E. Approved shop drawings must be submitted to the galvanizer for review and approval.
- F. Fabricator’s Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for the Project and with a record of successful in-service performance. Unless otherwise

approved in writing by Authority, fabricator must participate in the AISC quality certification program and be designated an AISC certified fabricator as follow:

1. Building and Facility Structures: Building QMS Certification (BU)
  2. Bridge Structures: Comply with IDOT Standard Specification for Certification of Metal Fabricator.
  3. Track Structures: Bridge QMS Certification, Advanced (ABR)
- G. Erector Qualifications: Unless otherwise approved by Authority in writing, a qualified erector who participates in the AISC Quality Certification Program and is designated as an AISC-Certified Erector, Category CSE.

## 1.06 PRODUCT HANDLING

- A. Do not deliver material to the project site until the proposed method and sequence of erection has been reviewed by the Authority. Method and sequence must be planned so as to avoid delay or damage to the work of other trades.
- B. Storage of fabricated steel at the job site must be the responsibility of the Contractor. Material stored at the job site must not exceed design loads on existing or newly-constructed structures so that members will not be distorted or otherwise damaged; and must be protected against corrosion or deterioration.

## PART 2 PRODUCTS

### 2.01 STRUCTURAL STEEL

- A. Structural steel including beams, columns, angles, channels, plates, etc. must comply with the provisions of the ASTM specifications for A992 material for building and facility structures, and A709 for bridge and track structures, unless noted otherwise on the Drawings.
- B. For bridge and track structures, material designated as FCM (Fracture Critical Material) must comply with Charpy V-Notch Testing requirements for Zone 2. For track structures, material not designated as FCM or designated as NTR (Notch Toughness Requirement) must comply with Impact Test Requirements for Zone 2 in Table 15-1-2 of AREMA "Manual for Railway Engineering", Chapter 15.
- C. Structural steel tubes must comply with ASTM A 500 Grade B, unless noted otherwise on the Drawings.
- D. Provide and install all miscellaneous structural steel members required for this project including lintels, leveling, plates, base plates, setting plates, etc.

### 2.02 WELDING ELECTRODES

- A. For building and facility structures, welding electrodes must comply with the provisions of AWS specifications A 5.1, A 5.5, A 5.17, A 5.18, and A 5.20. Weld electrodes must be E70XX unless required otherwise. For bridge and track structures, welding electrodes must comply with the provisions of Article 505.04 (q) of the IDOT Standard Specifications.
  1. To achieve a more uniform galvanized coating thickness and appearance, welding rod must deposit weld composition and amount of silicone matching that of the surrounding base metal and per steel mill reports.

## 2.03 BOLTS

- A. All high strength bolts, nuts and washers must comply with the provision of ASTM F3125 Grade A325.
- B. For pretensioned joint and slip critical joint, bolt/nut/washer must be supplied by one manufacturer as a complete assembly.
- C. All anchor bolts, nuts and washers must conform to the requirements of ASTM F1554, GR 36 unless otherwise shown on the drawings.

## 2.04 GALVANIZING, SHOP PRIMING AND FINISHING

- A. All new structural steel members and fabrications must be hot-dip galvanized conforming to ASTM A123 or ASTM A153. Where galvanized steel exposed to view after installation are finished with protective and finished coats as shown in the Drawings, see painting section of these specifications.
- B. Existing structural steel members and fabrications must be prepared and field finished with protective and finish coats according to painting section of these specifications.
- C. Repair/Renovation of damaged galvanized coating must conform to ASTM A780. Manufacturer's application procedures may be submitted for approval provided they conform with corresponding repair material type Annex. Thickness of repair must be verified as required by corresponding Annex. Acceptable repair material types and corresponding repair procedure must be as follow:
  - 1. Zinc-Based Solders: Must be per ASTM A780, Annex A1. Thickness of repair must match surrounding undamaged galvanized coating and as required for the class of material in ASTM A123 or ASTM A153.
  - 2. Paints Containing Zinc Dust: Must be per ASTM A780, Annex A2. Thickness of repair must be 50% greater than the thickness of the galvanized coating required for the class of material in ASTM A123 or ASTM A153. Exception to Annex A2.1.4: Spray application of paints is prohibited.
  - 3. Spray Molten Zinc (Metallizing) – Not an acceptable repair material type for structural steel in this specification.

## 2.05 MISCELLANEOUS MATERIAL

- A. Miscellaneous material, accessories, grout, etc. not listed above must be provided as specified hereinafter under the various items of work and/or as indicated on the drawings, or required for a complete structure according to specified standards.
- B. Provide supplemental structural steel support framing for metal deck where normal deck bearing is precluded by other framing members and around openings.

## 2.06 SOURCE QUALITY CONTROL

- A. All tests required in this Specification must be performed by the Testing Agency, or at the Contractor's option, by the manufacturer's Quality Control program, provided the Quality Control program and the testing reports are reviewed by the Testing Agency. The Testing Agency must furnish a letter and submit to the Authority confirming the manufacturer's Quality Control program complies with the requirements in this Specification, and the testing reports meet the approval criteria in the specific codes, specifications, and standards in Section 1.03. Additional testing required due to non-conforming work must be the responsibility of the Contractor. All reporting by the Testing Agency must be provided concurrently to both the Authority and the Contractor.

- B. Bolted connections must be inspected by the Testing Agency in accordance with the following:
1. Building and Facility structures: AISC Specifications for Structural Joints Using High-Strength Bolts Section 9. For pre-tensioned and slip critical joints, pre-installation verification must be performed in accordance with Section 7 of the AISC Specifications for Structural Joints Using High-Strength Bolts. Blind bolts are to be inspected by the Testing Agency per the manufacturer's ICC-ES report.
  2. Bridge and Track structures: IDOT Standard Specification Section 505. In addition to the after installation inspection, field rotational-capacity test in accordance with Article 505.04(f)(3) g.1 and pre-installation verification test in accordance with Article 505.04(f)(2) in IDOT Standard Specification must be performed. Article 505.04(f)(3)(d) does not apply and field rotational-capacity test must be witnessed by the Testing Agency.
- C. During fabrication, welding inspection and testing must comply with Section 1.05 A. Any type of crack or zone of incomplete fusion or penetration will not be acceptable.
1. Building and Facility structures: Specification for Structural Steel Buildings Chapter N Section N5 with the following clarifications and modifications:
    - (a) Tables N5.4-1, 2, and 3 where "O" presents, a minimum of 15% of the welded joints must be observed on a random basis.
    - (b) Nondestructive testing of welded joints is required per Section 3.14 of this Specification.
    - (c) Section 5b, structures must be considered as in Risk Category III per ASCE 7, and user note, "NDT of CJP groove welds in materials less than 5/16 in. thick is not required" will not apply.
    - (d) Section 5e, reduction of rate of ultrasonic testing will not be permitted.
  2. Bridge structures: AWS D1.5 Clause 6. In addition, Clause 12 for any structural components designated on the Drawings or in the special provisions as FCM (Fracture Critical Member) with the following clarifications and modifications:
    - (a) Section 6.1.3.1, the inspector must be an AWS Certified Welding Inspector (CWI) qualified and certified in conformance with the provisions of AWS QC1, *Standard for AWS Certification of Welding Inspectors*.
    - (b) Section 6.1.3.4 the individuals who perform NDT must be certified as NDT Level III and qualified per ASNT SNT-TC-1A as a Level II for NDT performed.
    - (c) Where code does not contain structural element welded joint inspection frequency requirements, Section 2.06 G will apply.
  3. Track structures: Section 1.05 C 2 must apply and AREMA "Manual for Railway Engineering", Chapter 15, "Steel Structures", Part 3 Section 3.5.5 and Part 1 Section 1.14.4, with the following clarifications and modifications made to AREMA reference:
    - (b) Section 3.5.5 b, groove welds must be tested with ultrasonic nondestructive testing method.
    - (c) Section 3.5.5 c, 100% flange-to-web fillet welds must be inspected by the magnetic particle method.
    - (d) Where codes do not contain structural element welded joint inspection frequency requirements, Section 2.06 G will apply.
- D. Access to locations where material for this contract is being fabricated or produced must be provided for the purpose of inspection and testing, including scaffolding.
- E. The Authority may inspect structural steel at the plant before shipment; however, the Authority

reserves the right to reject any material, at any time before final acceptance, which does not conform to all of the requirements of the drawings and specifications.

- F. The Testing Agency must perform visual and coating thickness inspections of hot-dip galvanized steel before the product leaves the galvanizer's plant. The "Sampling" and "Test Methods" of ASTM A123 and ASTM A153 must be followed as appropriate.
- G. Where codes do not contain structural element welded joint inspection frequency requirements as specified in Section 2.06 C, Non Destructive Testing must include not less than the following items. All testing is done on the final pass:
  - 1. Magnetic Particle Testing: 20% of continuity plate, end plate, and bracing gusset plate fillet welds, selected at random.
  - 2. Magnetic Particle Testing: 100% of tension member fillet welds, e. g. hanger rod connections, bracing members to gusset plate and gusset plate welds for the main lateral resistance system, and other similar connections.
  - 3. Ultrasonic Testing: 100% of full and partial penetration welds, e.g. built-up members and other similar members.
  - 4. Magnetic Particle Testing: 100% of built-up member fillet welds in zones of moment connections.
  - 5. Magnetic Particle Testing: 20% of other built-up member fillet welds, selected at random.
  - 6. Magnetic Particle Testing: 10% of other miscellaneous fillet welds, selected at random.
  - 7. All field welds on bridge and track structures, when approved by the Authority, must be tested 100% with Magnetic Particle Testing Method for fillet welds, and Ultrasonic Testing Method for groove welds.

## PART 3 EXECUTION

### 3.01 GENERAL

- A. Contractor must verify all dimensions and conditions in the field prior to fabricating and erecting structural steel. Notify the Authority of any major discrepancies.
- B. Field modification of structural steel is prohibited without prior written approval of the Authority.
- C. Structural steel for the bridge and track structures must be fabricated in accordance with Section 505, Steel Structures, of the IDOT Standard Specifications. In addition, track structures must be fabricated in accordance with AREMA "Manual for Railway Engineering", Chapter 15, "Steel Structures", Parts 3, Fabrication. Where difference occur in the provisions of the IDOT Standard Specification, AREMA "Manual for Railway Engineering", and this Specifications, the more stringent requirements must be followed as determined by the Authority.

### 3.02 FABRICATION

- A. Material must be properly marked and match-marked where field assembly is required. The sequence of shipments must be such as to expedite erection and minimize the field handling of material.
- B. Rolled material, before and after being laid off or worked, must be straight within the tolerances allowed by ASTM A6. If straightening is necessary, it must be done by methods which will not adversely affect the behavior of the material. If straightening is not necessary, natural camber of rolled sections must be placed upward.
- C. Fabricate and assemble structural steel in shop to greatest extent possible. Assemblies must conform

to the dimensions shown on the approved shop drawings.

- D. Beams must be cambered where indicated on the Drawings.
- E. Beam connections must be as shown or noted on the Drawings. Unless noted otherwise, standard connections must be used.
- F. Combination of bolts and welds must not be used for stress transmission in the same face of any connection.
- G. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on shop drawings.
  - 1. For building structures, cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning; ream holes that must be enlarged to admit bolts. Drill holes in bearing plates.
  - 2. For bridge structures, fastener holes must be in accordance with IDOT Standard Specification Article 505.04 (d).
  - 3. For track structures, fastener holes must be in accordance with AREMA "Manual for Railway Engineering", Chapter 15, "Steel Structures", Parts 3, Fabrication, with the following modifications:
    - (1) Section 3.2.6 g will not be permitted.
    - (2) Section 3.2.7 e will not be permitted.
- H. For steel to be galvanized, fabricate in accordance with Class I or II guidelines as described in AGA's Recommended Details for Galvanized Structures.

### 3.03 WELDING

- A. Welding processes other than shielded metal arc and submerged arc may be used provided procedure qualification tests in accordance with the American Welding Society are made for the intended application of any such process.
- B. Built-up sections assembled by welding must be free of warpage and all axes must have true alignment.
- C. Welds not specified must be continuous fillet welds, using not less than the minimum fillet as specified by AWS.
- D. All welding sequences must be such as to reduce the residual stresses due to welding to a minimum value. If high residual stresses are present, stress relieving of joints may be required.
- E. The toughness and notch sensitivity of the steel must be considered in the formation of all welding procedures to prevent brittle and premature fracture during fabrication and erection.
- F. Welded connections must be detailed and designed to minimize the accumulation and concentration of thru-thickness strains due to weld shrinkage.
- H. The maximum number of welded joint repairs is two unless otherwise approved by the Authority. Fabricator's welded joint repair procedure must be submitted to the Authority for approval, or the following pre-approved repair procedure may be used:
  - 1. Notify the Testing Agency prior to starting the repair procedure. Inspector from Testing Agency must witness the welded joint repair work.



2. Remove the welded component by cutting to 1/8" above the welds.
3. Using air carbon arc, being extremely careful not to damage the base metal, remove the weld and remaining welded component to within 1/8" of the base metal.
4. Grind the remaining weld and welded component smooth and flush with the surrounding base metal. Grind parallel to the direction of longitudinal axis of the weld.
5. Inspect all of the weld removal areas by magnetic particle test method either by the Testing Agency inspector or have the inspector witness the test.
  - (a) For track structures, time delay prior to magnetic particle test of weld repairs to groove welds for material over 2 inches in thickness, subject to tensile stress, as determined by the Authority on a case-by-case basis, must be 16 hours minimum.
6. Complete a corrective action report and provide a copy to the Authority confirming the base metal meets the material requirement in this Specification with no defect and is adequate for the welded joint rework.
7. Welded joint rework can start after the corrective action report is accepted by the Authority.

### 3.04 PREPARATION OF STEEL

- A. Perform all inspections prior to galvanizing or field finishing. Galvanized faying surfaces for slip critical joints shall not be roughened by means of hand wire brushing or power wire brushing. Galvanized faying surfaces for slip critical joints shall be protected/masked and be free of all oil, grease, dust, dirt, primer, or paint before final connections can be made.
- B. All non-galvanized existing structural steel surfaces must be prepared and cleaned as specified in the painting section of these specifications.
- C. Paint application must be in accordance with paint manufacturer's printed instructions and recommendations. The fabricator must submit paint system to be used for approval by the Authority prior to purchasing. All paint products must be compatible products from the same manufacturer.

### 3.05 APPLICATION OF GALVANIZING

- A. Galvanize steel members, fabrications, and assemblies to the greatest extent possible after fabrication by the hot dip process in accordance with ASTM A123 and ASTM A153. All structural steel must have all pieces attached by welding to the greatest extent possible as shown on drawings before galvanizing. All bolted pieces must be bolted together after galvanizing.
- B. Prior to galvanizing, structural steel must be cleaned of all mill scale, rust, spatter, slag or flux deposit, oil, dirt and other foreign material.
- C. Dip all structural steel members and metal fabrications assuring a sufficient coating of all surfaces, including corners, joints, holes, and other surfaces.
- D. Long steel members and large fabrications too large for a single dip in the galvanizing vat, must be dipped in maximum two applications to assure all surfaces are thoroughly and fully coated.
- E. Galvanize bolts, nuts and washers and iron and steel hardware components in accordance with ASTM A 153. Bolts, nuts, and washers must be a unit assembly when shipped to job site for slip critical and pretensioned joints.
- F. Safeguard products against steel embrittlement in conformance with ASTM A 143.

- G. Handle all articles to be galvanized in such a manner as to avoid any mechanical damage or any distortion.
- H. Where contract documents indicate that galvanized steel is to receive additional coatings as part of duplex coating system, galvanized surfaces must be prepared in accordance to ASTM D6386 for paint coating or ASTM D7803 for powder coatings.

### 3.06 GALVANIZING COATING REQUIREMENTS

- A. Coating Weight and Thickness must be per applicable ASTM:
  - 1. Conform with paragraph 5.1 of ASTM A 123, Table 1 and 2
  - 2. Conform with paragraph 4.3 of ASTM A 153, Table 1
- B. Surface Finish: Continuous, adherent, as smooth and evenly distributed as possible and free from any defect detrimental to the stated end use of the coated article.
- C. Adhesion: Withstand normal handling consistent with the nature and thickness of the coating and normal use of the article.

### 3.07 TESTS FOR GALVANIZING

- A. Galvanizer must inspect the entire galvanized surface to ensure compliance with ASTM requirements.
- B. Testing Agency to inspect and test hot dip galvanized coatings per the guidelines provided in the AGA publication "Inspection of Products Hot Dip Galvanized After Fabrication" and in conformance with ASTM A123 and ASTM A153.
- C. Galvanizer to furnish a certificate indicating compliance with ASTM Standards and Specifications herein listed. The certificate must be signed by the galvanizer and contain a detailed description of the material processed as well as information as to the ASTM standard used for the coating.

### 3.08 PAINTING

- A. See painting section of these specifications.
- B. Perform all inspections and repair all galvanizing prior to finishing.
- C. Galvanized steel must be prepared per ASTM D6386 for painting if required per the Drawing.
- D. Metal fabrications may have protective and finish coats installed in the shop if approved by the Authority. Do not provide finish coats to shop or field contact surfaces or within 2" of field welds. See painting section for description of protective and finish coats for steel.

### 3.09 BENCH MARKS

- A. The Contractor must employ the services of an Illinois registered professional surveyor who must establish permanent bench marks, field check all elevations of concrete on which structural steel is to be placed, locations of anchor bolts as well as location and elevation of any objects where the new steel is connected to or installed adjacent to. The contractor's surveyor must provide a letter prior to erection that verifies existing field conditions have been checked and coordinated with the steel shop drawings. If the surveyor notes any discrepancies, the Contractor must propose mitigation measures.

### 3.10 ERECTION

- A. The Contractor must be responsible for the accurate setting and leveling of all bearing plates or setting plates. Bearing plates or setting plates must be leveled on steel wedges or shims unless otherwise detailed.
- B. Furnish templates, where shown, specified or called for on the drawings. Furnish shim plates or developed fills where required to obtain proper fit and alignment.
- C. For bridge structures, structural steel must be assembled and erected in accordance with Section 505, Steel Structures, of the IDOT Standard Specifications and, also, in accordance with this Specification. For track structures, in addition to the requirements for bridge structures, structural steel must be assembled and erected in accordance with AREMA "Manual for Railway Engineering", Chapter 15, "Steel Structures", Parts 4, Erection. Where differences occur in the provisions of the IDOT Standard Specification, AREMA "Manual for Railway Engineering", and this Specification, the more stringent requirements must be followed, as determined by the Authority.
- D. For bridge and track structures, the Contractor and the Contractor's erection engineer must be responsible to determine how crossframes and diaphragms should be fitted. The Contractor and Contractor's erection engineer must perform girder drop analysis per AASHTO/NSBA Steel Bridge Erection Guide to determine the erected position of the girders and the condition under which that position is to be theoretically achieved. Girder drop analysis must be submitted to the Authority for review. No Load Fit (NLF or Fully Cambered Fit) should be avoided for skewed bridges or track structure spans with skew greater than 20 degrees.

### 3.11 ERECTION TOLERANCE

- A. The Contractor alone must be responsible for the correct fitting of all structural members and for the elevation and alignment of the finished structure. Any adjustments necessary in the steel frame because of discrepancies in elevations and alignment must be the responsibility of the Contractor.
- B. Unless otherwise noted, individual members of the structure must be leveled and plumbed to an accuracy of 1 to 500, but not to exceed 1/2" in columns for their full height, except exterior columns and columns adjacent to elevator beams must be accurate to 1 to 1,000 but not to exceed 1/2" for their full height or unless otherwise noted by the elevator manufacturer. All leveling and plumbing must be done based on the mean operating temperature of the structure. Allowances must be made for the difference in temperature at time of erection and the mean temperature at which the structure will be when completed and in service.
- C. Where building and facility steel structures are supported by bridge or track structures, detailing of the building and facility steel structures must consider the dead load deflection of the bridge or track structures at the stage when building and facility structures are erected. The erection tolerances specified in this Section applies to all steel structures, regardless of staging.

### 3.12 CONNECTIONS

- A. Connections between members and corners must be mitered unless approved otherwise.
- B. Welding or final bolting must not be done until as much of the structure as will be stiffened by the welding or bolting has been properly aligned.
- C. Drift pins must not be used to enlarge unfair holes in main material.
- D. When high strength bolts are used in pre-tensioned or slip-critical connections, bolt tensioning must be performed using "turn-of-nut method".

- E. For bridge and track structures, bolt heads must face out on the exterior of the web. For field splice, bolt nuts must be on top surface of the lower flange splice.

### 3.13 FIELD ALTERATIONS

- A. Modifications required to structural steel fabrications to facilitate proper installation including cutting, drilling or welding must be submitted to the Authority for written approval. Provide shop drawings of the proposed modifications certified by a licensed structural engineer in the State of Illinois.
- B. Protective coatings must be restored per appropriate, approved material type and procedure conforming to ASTM A780.

### 3.14 FIELD QUALITY CONTROL

- A. Connection Inspection: Perform 100% visual inspection of bolted connection installed as bearing type. Examine the surfaces, size, quality and placement of each connection to verify installation in accordance with Contract documents and approved shop drawings.
- B. Testing of High-Strength Bolted Connections installed as pretensioned and slip critical condition: inspect and test 100% bolts installed in snug-tight condition with match-marks are made, but prior to tightening to slip critical condition. After tightening by the turn-of-the nut method, bolted connection will be accepted on the basis of a visual inspection of the match-marks on the bolts.
- C. Field welding must be inspected and tested by the Testing Agency during the erection of the structural steel.
  - 1. For building and facility structures, Specification for Structural Steel Buildings Chapter N Section N5 will apply, with the modification that all marking "O" will be replaced by "P" for field welding.
  - 2. All other requirements specified in Section 2.06 C and G of this Specification will apply with the exception that testing frequency is 100%.
  - 3. For bridge and track structures, field welding is prohibited.

### 3.15 FIELD CLEANING, GALVANIZING TOUCH UP AND PAINTING

- A. Field cleaning and painting must conform to the requirements of the painting section of these specifications, including preparation of existing surfaces, and application of prime and finish coats at field welds, bolted connections, abraded areas and other areas of the exposed steel.
- B. Repair of damaged or uncoated areas of galvanized steel must be per approved repair material and approved detailed procedure conforming to ASTM A780. Damaged or uncoated areas must be previously galvanized steel surfaces that do not have the minimum required coating thicknesses as defined in the governing ASTM, ASTM A123 or ASTM A153.

END OF SECTION

SECTION 09 90 00  
PAINTING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification sections, apply to this section.

1.02 SUMMARY

- A. This Section includes surface preparation, painting, and finishing of exposed new and existing interior and exterior items and surfaces. Surface preparation, priming, and finish coats specified in this section are in addition to galvanizing, shop priming and surface treatment specified under other sections.
  - 1. For surface preparation of previously painted surfaces, if existing lead based paint is present or suspected to be encountered, notify the Authority for direction. The existing lead paint must be abated according to mandated procedures. See Section 02 72 00, "Lead Abatement" and/or Section 09 90 10, "Cleaning and Protective Coatings of Existing Surfaces".
- B. See drawings or otherwise verify which galvanized steel items are to have their galvanized finish left exposed and which items are to be painted after galvanized.
- C. Paint exposed surfaces whether or not colors are designated in "schedules," except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Authority will select from standard colors or finishes available.
- D. Painting includes field painting exposed bare and covered pipes and ducts (including color coding), exposed conduit, hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.
- E. Painting is not required on prefinished items, finished metal surfaces, concealed surfaces, operating parts, and labels. Unless noted otherwise, provide finish coats of paint over galvanized and primed surfaces.
  - 1. Prefinished items not to be painted include the following factory-finished components:
    - a. Prefinished roofing.
    - b. Finished mechanical and electrical equipment.
    - c. Light fixtures.
  - 2. Concealed surfaces not to be painted include wall or ceiling surfaces in the following generally inaccessible areas:
    - a. Pipe spaces.
    - b. Elevator shaft.
  - 3. Finished metal surfaces not to be painted include:

- a. Anodized aluminum.
    - b. Stainless steel.
    - c. Chromium plate.
  - 4. Operating parts not to be painted include moving parts of operating equipment.
  - 5. Labels: Do not paint over Underwriter's Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- F. Related Sections: The following sections contain requirements that relate to this section:
- 1. Division 05 Section "Structural Steel" including shop priming steel.
  - 2. Division 05 Section "Metal Fabrications" for shop priming ferrous metal.
  - 3. Division 08 Section "Standard Steel Doors and Frames" for shop priming steel doors and frames.
  - 4. Division 09 Section "Paint Testing".

### 1.03 DEFINITIONS

- A. "Paint" includes coating systems materials, primers, emulsions, enamels, sealers and fillers, and other applied materials whether used as prime, intermediate, or finish coats.

### 1.04 SUBMITTALS

- A. Product Data: Manufacturer's technical information, label analysis, and application instructions for each material proposed for use. List each material and cross-reference the specific coating and finish system and application. Identify each material by the manufacturer's catalog number and general classification.
- B. Warranty: Provide a copy of the written warranty, in a form acceptable to the Authority, from the coating manufacturer, countersigned by the applicator, stating that the system provided is as specified and any defects due to materials and/or workmanship shall be repaired and/or replaced at no cost to the Authority the specified time period.
- C. The coating manufacturer shall submit certification that the products in a multi-layer coating system are of the same manufacturer, appropriate for the intended use, are compatible with each other and with project substrates, and are compatible with any existing coatings.
- D. Samples for initial color selection in the form of manufacturer's color charts. After color selection, the Authority will furnish color chips for surfaces to be coated.
- E. Samples for verification purposes. Provide samples of each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate. Define each separate coat, including block fillers and primers. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture are achieved.
  - 1. Provide a list of material and application for each coat of each sample. Label each sample as to location and application.
- F. Provide certification that the installer(s) are approved by the manufacturer(s) for installation of their products.

- G. Installer shall provide approval of the preparation of the new or existing surfaces prior to installing the new primers and protective finishes.
- H. Process Plan: Provide a detailed process plan for each material being coated explaining each step in the coating process including, but not limited to, the following:
  - 1. Surface preparation and verification with the specification.
  - 2. Primer application and verification with the specification.
  - 3. Finish coat(s) application and verification with the specification.
  - 4. How testing is incorporated into the above process plans per Section 09 90 20, Paint Testing, of these specifications.

#### 1.05 QUALITY ASSURANCE

- A. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.
- B. Coordination of Work: Review other sections in which primers are provided to ensure compatibility of the total systems for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers. Notify the Authority of problems anticipated using the materials specified.
- C. Material Quality: Provide the manufacturer's best quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.
  - 1. Proprietary names used to designate colors or materials are not intended to imply that products named are required or to exclude equal products of other manufacturers.
  - 2. Federal Specifications establish a minimum quality level for paint materials, except where other product identification is used. Provide written certification from the manufacturer that materials provided meet or exceed these criteria.
  - 3. Products that comply with qualitative requirements of applicable Federal Specifications, yet differ in quantitative requirements, may be considered for use when acceptable to the Authority. Furnish material data and manufacturer's certificate of performance to Authority for proposed substitutions.
- D. Certification of Contractor: Contractor performing the work shall be approved by the paint manufacturer as a trained and certified installer of the manufacturer's paint products.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
  - 1. Product name or title of material.
  - 2. Product description (generic classification or binder type).
  - 3. Federal Specification number, if applicable.
  - 4. Manufacturer's stock number and date of manufacture.
  - 5. Contents by volume, for pigment and vehicle constituents.
  - 6. Thinning instructions.
  - 7. Application instructions.
  - 8. Color name and number.

- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg. F. Maintain containers used in storage in a clean condition, free of foreign materials and residue. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

#### 1.07 JOB CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg. F and 90 deg. F.
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg. F and 95 deg. F.
- C. Do not apply paint in snow, rain, fog, or mist, when the relative humidity exceeds 85 percent, at temperatures less than 5 deg. F above the dew point, or to damp or wet surfaces.
- D. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

#### 1.08 WARRANTY

- A. All painting work and the painting system shall be warranted by both the manufacturer(s) of all the materials and the installer(s) of all the materials to not fail in adhesion, color retention, gloss retention, chalking, cracking, fading, peeling, blistering, rust prevention, lack of protection of the surface or other malfunction as determined herein. The warranty shall include a statement that the substrate has been examined by the parties involved and that it was in proper condition or prepared properly for application of the specified paint system. The warranty shall also include a statement indicating that the specified paint system is compatible with the substrate, the various coatings specified, the conditions under which the system will be applied and the conditions under which the system will be used to protect the substrate.
  - 1. For previously painted substrates, the warranty for the new paint system shall be three (3) years from the date of acceptance by the Authority.
  - 2. For new substrates, the warranty for the paint system shall be for ten (10) years from the date of acceptance by the Authority.
- B. Painting systems that fail within the specified warranty periods shall be replaced by preparing the surfaces and re-applying according to manufacturer's directions and the Authority's approval. The extent of re-application shall be determined by the Authority. The work shall be done at no cost to the Authority for materials or labor.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. General Coatings: Subject to compliance with requirements, manufacturers offering products may be incorporated in the work include but are not limited to the following:



- |    |                                   |               |
|----|-----------------------------------|---------------|
| 1. | PPG Industries, Pittsburgh Paints | (Pittsburgh). |
| 2. | The Sherwin-Williams Company      | (S-W).        |
| 3. | Carboline Company                 | (Carbo)       |
| 4. | International Paint/Devoe         | (IP)          |

B. For Structural Steel Coatings:

- |    |                                   |
|----|-----------------------------------|
| 1. | Carboline                         |
| 2. | International Paint               |
| 3. | PPG Industries, Pittsburgh Paints |
| 4. | The Sherwin-Williams Company      |

2.02 PRIMERS (OTHER THAN FOR STRUCTURAL STEEL)

A. Interior Flat Latex-Based Paint: Flat latex paint used as a primer over concrete and masonry under alkyd flat and semi-gloss enamel:

- |    |             |   |
|----|-------------|---|
| 1. | Pittsburgh: | Seal Grip Acrylic Universal Primer 17-921 |
| 2. | S-W:        | Pro-Mar 200 Latex Flat B30W200.           |
| 3. | Carboline:  | Sanitile 120 Primer Sealer                |

B. Interior Flat Latex-Based Paint: Flat latex paint used as a primer on cement plaster under flat, semi-gloss, and full-gloss alkyd finishes:

- |    |             |   |
|----|-------------|---|
| 1. | Pittsburgh: | Perma-Crete Alkali Resistant Primer 4-603 |
| 2. | S-W:        | Wall and Wood Primer B49W2.               |
| 3. | Carboline:  | Sanitile 120 Primer Sealer                |

C. Synthetic, Rust-Inhibiting Primer: Quick-drying, rust-inhibiting primer for priming ferrous metal on the exterior under full-gloss and flat alkyd enamel and on the interior under flat latex paint or odorless alkyd semi gloss or alkyd gloss enamels:

- |    |                      |  |
|----|----------------------|--|
| 1. | Pittsburgh:          | 6-208 Red Inhibitive Metal Primer.             |
| 2. | S-W:                 | Kem Kromik Universal Metal Primer B50Z Series. |
| 3. | Carboline:           | # 150 or # GP 5 UP Rust proof Primers          |
| 4. | International Paint: | Devprime 1409                                  |

D. Galvanized Metal Primer: Primer used to prime interior and exterior zinc-coated (galvanized) metal surfaces:

- |    |                      |                                      |
|----|----------------------|--------------------------------------|
| 1. | Pittsburgh:          | Pitt-Tech Plus Acrylic Primer 90-912 |
| 2. | S-W:                 | Galvite HS B50WZ3.                   |
| 3. | Carboline:           | Galoseal Industrial Wash Primer      |
| 4. | International Paint: | Devprime 1409                        |

E. High-Performance Latex Block Filler: Heavy-duty latex block fillers used for filling open textured interior concrete masonry block before application of top coats:

- |    |                      |                                 |
|----|----------------------|---------------------------------|
| 1. | Carboline:           | Sanitile 120 Filler Sealer      |
| 2. | Pittsburgh:          | 6-7 Latex Masonry Block Filler. |
| 3. | S-W:                 | Heavy-Duty Block Filler B42W46. |
| 4. | International Paint: | Tru-Glaze WB 4015               |

## 2.03 UNDERCOAT MATERIALS (OTHER THAN FOR STRUCTURAL STEEL)

- A. Interior Enamel Undercoat: Ready-mixed enamel for use on the interior as an undercoat over a primer on concrete or masonry under odorless semi-gloss enamel:
1. Pittsburgh: Seal Grip Acrylic Primer 17-921
  2. S-W: Prep Rite 200 Latex Wall Primer B28W200.
  3. Carboline: Sanitile 120 Primer Sealer
  4. International Paint: Devprime 1409
- B. Interior Enamel Undercoat: Ready-mixed enamel for use as an undercoat over a primer on cement plaster under full gloss or odorless semi gloss enamels.
1. Pittsburgh: Seal Grip Acrylic Primer 17-921
  2. S-W: Wall and Wood Primer B49W2.
  3. Carboline: Sanitile 120 Primer Sealer
  4. International Paint: Devprime 1409
- C. Interior Enamel Undercoat: Ready-mixed enamel for use as an undercoat over a primer on ferrous or zinc-coated metal under interior alkyd semi-gloss enamel or full-gloss alkyd enamel:
1. Pittsburgh: Seal Grip Acrylic Primer 17-921
  2. S-W: Pro-Mar 200 Alkyd Semi-Gloss B34 Series.
  3. Carboline: 3358 Acrylic Primer
  4. International Paint: Devprime 1409

## 2.04 EXTERIOR FINISH PAINT MATERIAL (OTHER THAN FOR STRUCTURAL STEEL)

- A. Alkyd Gloss Enamel: Weather-resistant high-gloss enamel for use over primed ferrous metal surfaces:
1. Pittsburgh: DevGuard Alkyd Gloss 4309
  2. S-W: Industrial Enamel VOC B54Z Series.
  3. Carboline: Carbocoat 30 or GP 14 H/S
  4. International Paint: Devlac 1432
- B. Alkyd Gloss Enamel: Weather-resistant high-gloss enamel for use over primed, zinc-coated (galvanized) metal surfaces and aluminum:
1. Pittsburgh: DevGuard Alkyd Gloss 4309
  2. S-W: Industrial Enamel VOC B54Z Series.
  3. Carboline: Carbocoat 30 or GP 14 H/S
  4. International Paint: Devlac 1432

## 2.05 INTERIOR FINISH PAINT MATERIAL (OTHER THAN FOR STRUCTURAL STEEL)

- A. Interior Semi-gloss Odorless Alkyd Enamel: Low-odor, semi-gloss, alkyd enamel for use over a primer and undercoat on concrete, masonry (including concrete masonry block), cement plaster, gypsum board, and both ferrous and zinc-coated (galvanized) metal surfaces.
1. Pittsburgh: DevGuard S/G 4306
  2. S-W: Pro-Mar 200 Alkyd Semi-Gloss B34 Series.

3. Carboline: 3359 Acrylic Enamel
- B. Latex-based, Interior Flat Paint: Ready-mixed, latex based paint for use over plaster and gypsum board surfaces.
  1. Pittsburgh: Speedhide Zero VOC Latex Flat 6-4110 XI
  2. S-W: Pro-Mar 200 Latex Flat B30W200 Series.
  3. Carboline: 3359 Acrylic Enamel
- C. Exterior alkyd gloss enamel for use over above specified primer and undercoat on interior plaster or gypsum board surfaces, ferrous and zinc-coated metal surfaces:
  1. Pittsburgh: Speedhide Zero VOC S/G Latex 6-4510 XI
  2. S-W: Industrial Enamel VOC B54Z Series.
  3. Carboline GP 14 H/S
  4. International Paint Devlac 1432

## 2.06 COATINGS FOR STRUCTURAL STEEL

- A. The selected coating systems shall be suitable for long term protection of structural steel including structure for track, platform, canopy, stations, buildings, elevator, stairs, escalator, entrances and exits, and associated structures.
- B. Approved Manufacturers for Coatings for Structural Steel
  1. Carboline
  2. International Paint
  3. PPG Industries
  4. Sherwin Williams
- C. New Steel - Galvanized Metal (Protective Coat)
  1. Carboline: Carbomastic 15/ Carbomastic 615 Al (Low Temp)
  2. International Paint: Interseal 670HS
  3. PPG: Amerlock 2 Aluminum & Amerlock 400 Aluminum
  4. Sherwin Williams: Epoxy Mastic Aluminum II
- D. New Steel – Galvanized Metal (Finish Coat Aliphatic Urethane)
  1. Carboline: Carbothane 133 H/B Urethane Finish
  2. International Paint: Interthane 990HS
  3. PPG: Amercoat 450H
  4. Sherwin Williams: SherThane 2K Urethane
- E. Existing Steel – Previously painted metal surfaces cleaned as approved by the Authority and coated as follows: Spot prime, full protective coat, and full finish coat.
- F. Existing Steel – Full Protective Coat
  1. Carboline: Carbomastic 15/ Carbomastic 615 Al (Low Temp)
  2. International Paint: Interseal 670HS
  3. PPG: Amerlock 2 Aluminum & Amerlock 400 Aluminum
  4. Sherwin Williams: Epoxy mastic Aluminum II

G. Existing Steel – Full Finish Coat

- |                         |                                    |
|-------------------------|------------------------------------|
| 1. Carboline:           | Carbothane 133 H/B Urethane Finish |
| 2. International Paint: | Interthane 990HS                   |
| 3. PPG:                 | Amercoat 450H                      |
| 4. Sherwin Williams:    | SherThane 2K Urethane              |

2.07 PROTECTIVE COAT PAINT FOR STRUCTURAL STEEL

A. Protective Coat; 3-5 mils dry film thickness over galvanized steel and 7-11 mils dry film thickness over non-galvanized steel. Self-priming, two-component, modified epoxy mastic, aluminum pigment. The epoxy mastic shall be a one (1) coat, high-build complete protective coating system certified by the manufacturer as being appropriate for use over marginally prepared rusted, pitted and coated steel surfaces. It shall be supplied as two-part material with a one-to-one volume mix ratio, and shall be well ground and not caked, skinned or substantially settled in the container.

B. Composition:

1. Pigment: The pigment shall be leafed aluminum. Secondary pigments shall be rust-inhibiting and adhesion-promoting types.
2. Vehicle: The vehicle shall be of the epoxy-type modified with a bitumen like substance. The curing agent shall have suitable insensitivity to moisture to allow trouble-free application during normal humidity conditions.
3. The epoxy mastic shall contain 90% minimum solids by volume, tested according to ASTM D3960 modified to a dry time of seventy-two (72) hours at 100 degrees F rather than three (3) hours at 105 degrees F.
4. The shelf life of the epoxy mastic components shall be no shorter than (12) months, so that no caking of fillers, skins or gelation occurs.
5. Viscosity: Component A and Component B shall have mixed viscosity of 110-140KU, at 75 degrees F plus or minus 2 degrees F.

C. Properties of Mixed Paint:

1. The epoxy mastic shall air cure at temperatures of 75 degrees F or above to a hard and tough film within five (5) days by evaporation of solvent and chemical reaction. At 75 degrees F, within twenty-four (24) hours, it shall be dry to the touch and able to receive foot traffic within forty-eight (48) hours.
2. The pot life of the epoxy mastic shall not be shorter than four (4) hours at 75 degrees F, un-thinned.
3. The mixed paint weight per gallon shall be 10.2 pounds minimum at 75 degrees F Fahrenheit plus or minus 2 degrees F.
4. Film Build: The catalyzed mixture, thinned 10% by volume with the manufacturer's specified thinner, shall be spray applied at 10 mils wet film thickness without exhibiting runs or sags.
5. The average dry film thickness of the one-coat finish system shall be 7 to 11 mils.
6. The epoxy mastic shall not be applied when the surrounding air temperature is below 50 degrees F and shall not be applied when the temperature is expected to drop to 40 degrees F or below before the coating has cured.

D. Test Requirements: The epoxy-mastic manufacturer shall provide test data acceptable to the Engineer demonstrating that the epoxy-mastic coating system has been subjected to, and has successfully performed in testing equal in severity to the following tests.

1. Test Panel Preparation: The test panels shall be steel, having dimensions of 2" x 5" x 1/8" or as otherwise required by ASTM specification. The panels shall have coating surfaces prepared by sandblasting to a white metal in accordance with SSPC-SP-5-63 specification after which they shall be exposed to Midwest weather for thirty (30) days so that a uniform rusting occurs. They shall then be hand-cleaned with a wire brush in accordance with SSPC-SP-2-63 specification. Test panels shall then be coated and cured with epoxy mastic as follows: The epoxy-mastic shall be spray applied to the steel panels at 5 mils dry film thickness in one (1) coat. The coating shall be cured as specified by the manufacturer. Unless otherwise noted, panels shall then be scribed down to the substrate metal with an "X" of at least two (2) inch legs prior to being subjected to resistance testing.
2. Flexibility Test: ASTM D 552. The panel shall be sandblasted in accordance with SSPC-SP5-63 Specification.
3. Temperature Cycling Test: ASTM D 2246 (15 cycles).
4. Weathering Resistance Test: ASTM G 53 (1000 hour).
  - a. The coated and scribed test panels shall then be exposed to ultra-violet and condensation exposure as outlined in the specification for the total exposure period.
  - b. Upon examination after 1000 hours of exposure, the panels shall be unaffected except for discoloration of the epoxy-mastic coating. There shall be no blistering, softening or visible rusting on the coating beyond 1/16 of an inch from the center of the scribe marks.
5. Fresh Water Resistance Test:
  - a. The coated and scribed panels shall be immersed in fresh tap water at 75 degrees F plus or minus 5 degrees F.
  - b. Upon examination after thirty (30) days immersion, the panels shall be unaffected except for discoloration of epoxy-mastic coating; there shall be no blistering, softening or visible rusting on the coating beyond 1/16 of an inch from the center of the scribe marks.
6. Salt Water Resistance Test:
  - a. The coated and scribed panels shall be immersed in 5% sodium chloride solution at 75 degrees F plus or minus 5 degrees F for a period of 30 days.
  - b. The panels shall be unaffected except for discoloration of the epoxy-mastic coating upon inspection after 7, 14, and 30 days. There shall be no blistering, softening or visible rusting on the coating beyond 1/16 of an inch from the center of the scribe marks. The sodium chloride solution shall be replenished with fresh solution after each examination.
7. Salt Fog Resistance Test:
  - a. The coated and scribed panels shall be tested in a salt fog cabinet using 10% synthetic sea salt solution.
  - b. After 1,000 hours of continuous exposure, the coating shall show no loss of bond, nor shall it show rusting or blistering beyond 1/16" from the center of the scribed marks.

8. Gloss Test

- a. The standard for measuring gloss level is ASTM D523, "Standard Test Method for Secular Gloss" of 70 degrees and above.

E. Field History:

- 1. Documentation shall be provided verifying successful use of the epoxy mastic coating in the field. The coating should have been successfully used on at least 100 projects that required at least 100 gallons per project. The performance history must also be for a minimum of three (3) years in a similar environment as the intended use.

F. Packaging and labeling:

- 1. The epoxy-mastic coating shall be packaged in two (2) containers, labeled Part A and Part B. The components shall be packaged in such proportions that the Part A when mixed with the Part B will yield ten (10) gallons of mixed paint. Each container shall bear a label on which shall be clearly shown the manufacturer or brand name of the paint, the batch or lot number and the date of manufacture.
- 2. The label on the vehicle container shall also include complete instructions for the use of this paint. The container shall be coated if necessary to prevent attack by the paint components.

G. Protective coat and top coat material shall be made by the same manufacturer.

2.08 TOP COAT PAINT FOR STRUCTURAL STEEL

- A. Top Coat; Aliphatic Acrylic Urethane, 2 mils minimum 5 mils maximum single coat dry film thickness, for ultraviolet protection and aesthetics. Finish colors for track structure (when not left galvanized), elevated structure from grade level to platform level, platform stringers, station structure, canopy, elevator towers, stairs, railings, and all miscellaneous steel shall match Federal Standard Color Numbers as indicated on the drawings or as directed by engineer. Sheen for all colors is "gloss".
- B. Manufacturer: Protective coat and top coat material shall be made by the same manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions under which painting will be performed for compliance with requirements for application of paint. Do not begin paint application until unsatisfactory conditions have been corrected. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

3.02 PREPARATION

- A. General Procedures: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items in place that are not to be painted, or provide surface applied protection prior to surface preparation and painting. Remove these items if necessary for complete painting of the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved. Clean surfaces before applying paint or surface

treatments. Remove oil and grease prior to cleaning. Schedule cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

- B. Surface Preparation - General: Clean and prepare surfaces to be painted in accordance with the manufacturer's instructions for each particular substrate condition and as specified.
1. Provide barrier coats over incompatible primers. Notify the Authority in writing of problems anticipated with using the specified finish-coat material with substrates provided by others.
  2. Previously Painted Surfaces: Scrape to remove existing flaking or loose paint. Fill in voids. Sand smooth. Removal of existing lead based paint requires containment and proper disposal.
  3. Cementitious Materials: Prepare concrete masonry block, and cement plaster surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
    - a. Use abrasive blast-cleaning methods if specified by the paint manufacturer.
    - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's printed directions.
  4. New Ferrous Metals Non-Galvanized: Clean non-galvanized ferrous metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with specifications of the Steel Structures Painting Council. Pressure hose to rinse and allow to dry.
    - a. Blast steel surfaces clean as specified by the paint system manufacturer and in accordance with requirements of SSPC specification SSPC-SP 6.
    - b. Treat bare and sandblasted or pickled clean metal with metal treatment wash coat before priming.
    - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents specified by the paint manufacturer, and touch up with the same primer as the shop coat.
  5. Existing Ferrous Metals: Clean existing ferrous metal surfaces with Ultra High Pressure Water Wash SSPC-SP 12 with containment and disposal.
    - a. Cleaning shall leave the surface free of all visible oil, grease, dirt, dust, loose mil scale, loose rust, and loose paint. Mill scale, rust, and paint are considered adherent if they cannot be removed by lifting by a dull putty knife or cracked off by impact by a hand chipping hammer.
    - b. The standards established by Visual Surface preparation definition WJ-1 and non-visual surface preparation definition SC-1 of SSPC-SP 12 shall be satisfied.
    - c. As part of surface preparation, deposits of oil, grease and foreign matter must be removed by ultrahigh-pressure water jetting, by steam cleaning

- with detergent, by methods in accordance with SSPC-SP 1 or by another method approved by the Authority.
    - d. It is necessary to use an inhibitor that prevents rust forming after rinsing.
- 6. Galvanized Surfaces: Clean galvanized surfaces with non-petroleum based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- 7. Repair of damaged galvanizing: The maximum area to be repaired is defined in accordance with ASTM A 123 Section 4.6 current edition. Minimize the area to be repaired in the field.
- 8. Repair areas damaged by welding, flame cutting or during handling, transport or erection, by one of the approved methods in accordance with ASTM A 780 whenever damage exceeds 3/16" in width. Minimum thickness requirements for the repair are those described in ASTM A 123 Section 4.6 current edition.
  - a. Submit proposed galvanizing repair work, including locations, to the Authority for review and approval.
- 9. Preparing Hot Dip Galvanized Steel Surfaces for Painting:
  - a. All exposed galvanized steel items are to be finished with field applied protective and finish coats.
  - b. Zinc high spots should be removed by cleaning with hand or power tools as described in SSPC Surface Preparation Specification 2 or 3. The zinc should be removed until it is level with the surrounding area, taking care that the base coating is not removed by the cleaning methods. After cleaning, inspect for conformance to the required zinc thickness. Repair all areas falling below required zinc thickness.
  - c. For surfaces that have been galvanized for at least 24 hours, clean surfaces with an alkaline solution to remove traces of oil, grease, or dirt. Solution can be applied through immersion in a tank filled with the solution, sprayed on, or brushed on with a soft bristle brush. Rinse thoroughly with water and allow to dry.
  - d. Surfaces may also be cleaned of oil and grease using cleaning solvents such as mineral spirits in SSPC Surface Preparation Specification 1. Wipe galvanized surfaces using rags or brushes. After cleaning, rinse with water and allow to dry.
  - e. Hand or power tool cleaning may be used to clean light deposits of zinc reaction by-products as specified in SSPC Surface Preparation Specification 2 or 3.
- 10. Galvanized steel surfaces to be prepared per ASTM D6386 for painting.
- 11. All newly galvanized surfaces to be field painted shall be roughened by using one of the following methods:
  - a. Abrasive sweep or brush blasting, taking care to not remove excess zinc layers. After abrasive blast cleaning, surfaces should be blown down with clean, compressed air.
  - b. Conversion-coating process with an acidic zinc phosphate solution containing oxidizing agents and other salts for accelerating the conversion action. After 3 to 6 minutes, wash with clean water and allow to dry.
  - c. Wash primer treatment consisting of a metal conditioner to neutralize



- d. surface oxides and hydroxides and to etch the surface.  
Passivation/pretreatment process consisting of applying an acidic acrylic solution to the newly galvanized surface and then allowing it to dry, forming a thin film coating.
- E. Materials Preparation: Carefully mix and prepare paint materials in accordance with manufacturer's directions.
  - 1. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.
  - 2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
  - 3. Use only thinners approved by the paint manufacturer, and only within specified limits.
- F. Tinting: Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat so that missed areas will be visually apparent.

### 3.03 APPLICATION - STEEL

- A. General: For field applied coatings, the coatings shall be applied only when weather conditions and steel surface conditions comply with the coating manufacturer's specifications or as modified herein. The contractor shall take whatever steps are necessary to maintain controlled environment in order to ensure that pre-application, application and post application conditions are in accordance with these documents and the coating manufacturer's specifications. Coatings shall be applied at the specified spreading rates, but thickness shall not be less than the minimum dry film thickness specified. Should the spreading rate fail to produce the required thickness in one coat, additional coating shall be applied until the minimum requirements are met.
- B. Coatings shall be handled and applied in strict compliance with the manufacturer's specifications or as modified herein, including storage, mixing, environmental conditions, and additives for accelerated drying if necessary. All coating materials shall be delivered to the applicator in the manufacturer's original containers, unopened and with the label bearing the manufacturer's name, product identification and application instructions.
  - 1. No coating work shall be conducted when the steel substrate surface temperature is less than 5 degrees F above the dew point.
  - 2. The protective coat shall not be applied when the surrounding air temperature is below 50 degrees F and shall not be applied when the temperature is expected to drop to 40 degrees F or below before the coating has cured unless approved otherwise by the manufacturer. The use of a special Part B for the epoxy may be required for the lower temperatures.
- C. New Steel:
  - 1. Galvanize.
  - 2. Protective Coat: 3 to 5 mil. D.F.T. epoxy mastic aluminum pigment.
  - 3. Top Coat: One (1) coat of top coat material, 2 mils minimum, 5 mils maximum dry film thickness in one coat.

D. Existing Steel:

1. Previously painted metal surfaces shall be cleaned as approved by the Authority and then field coated as follows:
  - a. Protective Coat: All cleaned areas of the entire metal structure plus 3 inches of adjacent concrete surfaces shall receive one (1) coat of protective coating material seven (7) mils dry film thickness, minimum, and eleven (11) mils dry film thickness, maximum above the metal substrate.
  - b. Top Coat: 2.0 mils min. D.F.T. and 5 mils max. D.F.T. in one single coat aliphatic acrylic urethane (greater D.F.T. shall be used if required to achieve uniform surface finish. Increase D.F.T. by 1 heavier coat or by additional coat as required by manufacturer's directions).

3.04 APPLICATION - GENERAL

- A. Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
- B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
  1. Some paint colors, surface treatments, and finishes are indicated in "schedules."
  2. Provide finish coats that are compatible with primers used.
  3. The number of coats and film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as specified by the manufacturer. Sand between applications where sanding is required to produce an even smooth surface in accordance with the manufacturer's directions.
  4. All welds, inside corners, crevices, and exposed fasteners as well as areas where spray guns cannot reach shall be free of dirt, dust, etc. and shall receive a stripe coat of primer, applied by brush, before application of the main coating. Stripe coat must be color contrasting and must be dry before any overcoating takes place.
  5. Apply additional top coat(s) when undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance.
  6. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, and similar components are in place. Extend coatings in these areas as required to maintain the system integrity and provide desired protection.
  7. Surfaces which will be inaccessible after erection of other elements shall be painted prior to the installation of the obstructing item. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.
    1. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, nonspecular black paint.
    2. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
    3. Finish exterior doors on tops, bottoms, and side edges same as exterior faces.
    4. Sand lightly between each succeeding enamel coat.

5. Omit primer on metal surfaces that have been shop-primed and touch up painted.
- C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration. Allow sufficient time between successive coats to permit proper drying and according to manufacturer's directions. Do not recoat until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure and where application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
- D. Minimum Coating Thickness: Apply materials at not less than the manufacturer's specified spreading rate or as specified in this specification whichever is greater. Provide a total dry film thickness of the entire system as specified by the manufacturer or as specified in this specification whichever is greater.
- E. Block Fillers: Apply fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- F. Prime Coats: Before application of finish coats, apply a prime coat of material as specified by the manufacturer to material that is required to be painted or finished and has not been prime coated by others or galvanized. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to assure a finish coat with no burn through or other defects due to insufficient sealing. Where the primer is faulty, or has been damaged, and at on-site welded areas the primed surface shall be cleaned (blasted if required) and re-primed.
- G. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- H. Completed Work: Match approved samples for color, texture, sheen and coverage. Remove, refinish, or repaint work not in compliance with specified requirements.
- I. To prevent low film thickness, all angles, welds, crevices, external edges, corners, nuts and bolts, shall, for each coating to be applied, be coated once prior to the coating of the whole area. The Contractor shall ensure that the whole surface is covered with paint being applied to all sides of obstructions such as bolts and nuts.
- J. Avoid excessive film build-up which may result in "mud cracking". If such areas do occur they must be blast cleaned in accordance with this specification and repaired.
- K. Paints should be applied in the correct sequence at the required spreading rate to enable the coating system to perform the function for which it was formulated. Full drying time should be allowed between successive coats of paint.
- L. The minimum coating thickness shall be as specified for each paint system and the maximum thickness in any one application (single coat) must not exceed that recommended by the paint manufacturer or the maximum DFT specified in this specification .
- M. Recoating: If film thickness is insufficient or recoating is required for any reason, maximum intervals between successive topcoats shall be in accordance with the manufacturer's recommendations, but in no case shall be more than seven days. If the

intervals exceed seven days, the entire surface shall be lightly blasted with a fine abrasive to provide adequate mechanical bond.

- N. Reinstatement of Damaged Topcoats: Where an item which has been partially or fully top coated is subject to coating damage, the primer surface at the damaged area shall be reinstated as specified above and then top coated in accordance with the procedures for original top coating. If the damage is confined to the topcoat only and the primer surface is not exposed, the topcoat shall be lightly brush blasted, cleaned and recoated as for the original topcoat.

### 3.05 PAINTING OF MECHANICAL AND ELECTRICAL ITEMS

- A. Painting mechanical and electrical work is limited to items exposed in mechanical equipment rooms and in occupied spaces.
- B. Mechanical items to be painted include but are not limited to:
  - 1. Piping, pipe hangers, and supports.
  - 2. Heat exchangers.
  - 3. Tanks.
  - 4. Ductwork.
  - 5. Insulation.
  - 6. Supports.
  - 7. Motors and mechanical equipment.
  - 8. Accessory items.
- C. Electrical items to be painted include but are not limited to:
  - 1. Conduit and fittings.
- D. After cleaning of surfaces, remove all traces of rust, mill scale, corrosion, and loose or flaky paint with power or hand tools.

### 3.06 FIELD QUALITY CONTROL

- A. The Authority reserves the right to invoke the following test procedure at any time and as often as the Authority deems necessary during the period when paint is being applied:
  - 1. Test paint for minimum required film thickness.
  - 2. The Contractor shall engage the services of an independent testing laboratory to sample the paint material being used. Samples of material delivered to the project shall be taken, identified, sealed, and certified in the presence of the Contractor.
  - 3. The testing laboratory shall perform appropriate tests for the following characteristics as required by the Authority:
    - a. Quantitative materials analysis.
    - b. Abrasion resistance.
    - c. Apparent reflectivity.
    - d. Flexibility.
    - e. Washability.
    - f. Absorption.

- g. Accelerated weathering.
- h. Dry opacity.
- i. Accelerated yellowness.
- j. Recoating.
- k. Skinning.
- l. Color retention.
- m. Alkali and mildew resistance.

- 4. If test results show material being used does not comply with specified requirements, the Contractor may be directed to stop painting, remove noncomplying paint, pay for testing, repaint surfaces coated with rejected paint, and remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two coatings are not compatible, at no cost to the Authority.

### 3.07 CLEANING

- A. Cleanup: At the end of each work day, remove empty cans, rags, rubbish, blasting material, and other discarded paint materials from the site.
- B. Oily or paint-filled rags or waste and other combustible materials shall be the responsibility of the Contractor. The Contractor shall dispose of these materials in metal containers with tight fitting lids on a daily basis. The proper disposal of these materials is the responsibility of the Contractor.
- C. Prior to final completion and acceptance, the Contractor shall examine all painted and finished surfaces and retouch or refinish as necessary to leave all surfaces in acceptable condition.
- D. Upon completion of work, the Contractor shall remove all paint and varnish spots from floors, glass and other surfaces and remove all rubbish and accumulated materials of whatever nature from premises. Work areas shall be left in a clean, orderly and acceptable condition.

### 3.08 PROTECTION

- A. Protect work of other trades, whether to be painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Engineer.
- B. Provide "wet paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.09 PAINT SCHEDULES

- A. NOTE REGARDING PAINT SCHEDULES: REGARDLESS OF LOCATION, UNLESS INDICATED OTHERWISE WITHIN THE CONTRACT DOCUMENTS OR APPROVED OTHERWISE BY THE AUTHORITY IN WRITING, ALL SURFACES FOR CTA PROJECTS SHALL BE CONSIDERED AS "EXTERIOR" SURFACES ONLY.

### 3.10 EXTERIOR PAINT SCHEDULE

- A. General: Provide the following paint systems for the various exterior substrates indicated.
- B. Ferrous Metal Other Than Structural Steel: Primer is not required on shop-primed items. Full-Gloss Alkyd Enamel, two finish coats over primer.
1. Primer: Synthetic rust-inhibiting primer.
    - a. International Paint: Devprime 1409.
    - b. PPG: Speedhide Red Rust Inhibitive Steel Primer 6-208.
    - c. S-W: Kem Bond HS Universal Metal Primer
  2. Undercoat and Finish Coat:
    - a. International Paint: Devlac 1432
    - b. PPG: DevGuard Alkyd Gloss 4309
    - c. S-W: Industrial Enamel HS
- C. Zinc-Coated Metal other than Structural Steel: Semi-Gloss Alkyd Enamel, two finish coats over primer.
1. Primer:
    - a. International Paint: Devprime 1409
    - b. PPG: Speedhide 6-209 Galv Primer
    - c. S-W: Pro Industrial Pro-Cryl Universal primer
  2. Undercoat and Finish Coats:
    - a. International Paint: Devlac 1432
    - b. PPG: DevGuard Alkyd Gloss 4309
    - c. S-W: Metalastic DTM Acrylic Modified Enamel
- D. Zinc-Coated Metal other than Structural Steel: High-Gloss Alkyd Enamel, two finish coats over primer.
1. Primer:
    - a. International Paint: Devprime 1409.
    - b. PPG: 90-709 Pitt-Tech One Pack Interior/Exterior Primer finish DTM Industrial Enamel.
    - c. S-W: Pro Industrial Pro-Cryl Universal Primer
  2. Undercoat and Finish Coats: Gloss alkyd enamel.

- a. International Paint: Devlac 1432
  - b. PPG: DevGuard Alkyd Gloss 4309
  - c. S-W: Industrial Enamel HS
- E. Wood: Alkyd Gloss Finish: three coats.
  - 1. Primer:
    - a. International Paint: Devprime 1409
    - b. PPG: Seal Grip Acrylic Primer 17-921
    - c. S-W: Industrial Enamel HS
  - 2. Undercoat and Finish Coat:
    - a. International Paint: Devlac 1432
    - b.. PPG: Speedhide Ext. Gloss 6-8534
    - c. S-W: Industrial Enamel HS
- F. Paint Color Schedule for Exterior Structural Steel:
  - 1. All track structure below track level shall be left with galvanizing exposed (not painted).
  - 2. All structural steel above track level; platform structure and platform stringers; station building steel; canopy steel; all miscellaneous steel above track level; and all steel for elevator towers, escalators, stairs, railings (including to street); shall be painted after galvanizing. The color and gloss shall be as designated on drawings or as selected by the Authority.
- G. Cement plaster ceilings and soffits:
  - 1. Semi-gloss, Acrylic-Enamel Finish: 2 finish coats over a primer.
    - a. Primer: Alkali-resistant, exterior, acrylic-latex primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils (0.036 mm).
      - 1) International Paint: Devcryn 1440
      - 2) PPG: Perma-Crete Alkali Resistant Primer 4-603
    - b. First and Second Coats: Semi-gloss, exterior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.4 mils (0.061 mm).
      - 1) International Paint: Devcryn 1449
      - 2) PPG: 78 Line Sun-Proof Semi-Gloss Acrylic Latex House and Trim Paint.
      - 3) S-W: A-100 Exterior Latex Gloss

### 3.11 INTERIOR PAINT SCHEDULE

- A. General: Provide the following paint systems for the various interior substrates, as indicated.

B. Gypsum Board: Satin or semi-gloss latex finish: three coats.

1. Primer:

- |    |                      |                                     |
|----|----------------------|-------------------------------------|
| a. | International Paint: | Devcryl 1440                        |
| b. | PPG:                 | Speedhide Primer 6-2                |
| c. | S-W:                 | ProMar 200 Zero VOC Interior Primer |

2. Undercoat and Finish Coat:

- |    |                      |  |
|----|----------------------|--|
| a. | International Paint: | Devcryl 1449                               |
| b. | PPG:                 | Speedhide Zero VOC S/G 6-4510 XI           |
| c. | S-W:                 | ProMar 200 Zero VOC Interior Latex Eg-Shel |

C. Gypsum Board: Water-based epoxy, gloss finish: three coats.

1. Primer:

- |    |                      |                                  |
|----|----------------------|----------------------------------|
| a. | International Paint: | Devran 203                       |
| b. | PPG:                 | Seal Grip Acrylic Primer 17-921  |
| c. | S-W:                 | ProMar 200 Zero VOC Latex Primer |

2. Undercoat and Finish Coat:

- |    |                      |   |
|----|----------------------|---|
| a. | International Paint: | Tru-Glaze WB 4438                         |
| b. | PPG:                 | Pitt-Glaze WB Acrylic Epoxy 16-551/16-598 |
| c. | S-W:                 | ProMar 200 Latex Gloss                    |

D. Wood: Opaque gloss alkyd finish: three coats

1. Primer:

- |    |      |                                 |
|----|------|---------------------------------|
| a. | PPG: | Seal Grip Acrylic Primer 17-921 |
| b. | S-W: | Industrial Enamel HS            |

2. Undercoat and Finish Coat:

- |    |      |                        |
|----|------|------------------------|
| a. | PPG: | Speedhide Gloss 6-8534 |
| b. | S-W: | Industrial Enamel HS   |

E. Wood: Stained and varnished gloss finish: four coats.

1. Stain Coat: Alkyd-based, wood stain applied at spreading rate recommended by the manufacturer.

- |    |      |   |
|----|------|---|
| a. | PPG: | Olympic 44500 Oil Based Wood Stain        |
| b. | S-W: | Wood Classics 250 VOC Interior Oil Stain. |

2. Sealer Coat: Clear sanding sealer applied at spreading rate recommended by the manufacturer.

- |    |      |  |
|----|------|--|
| a. | PPG: | Olympic Oil Based Sanding Sealer       |
| b. | S-W: | Wood Classics Fast Dry Sanding Sealer. |



3. Finish Coats: Two coats alkyd-based or polyurethane varnish, as recommended by the manufacturer, applied at spreading rate recommended by the manufacturer; sand lightly between coats. Gloss as selected by the Authority.
  - a. PPG: Olympic Fast Dry Varnish 43887 Satin
  - b. S-W: Wood Classics Waterborne Polyurethane varnish
  
- F. Ferrous Metal other than Structural Steel, Columns, and Stairways: Full-Gloss, Alkyd-Enamel Finish, three coats.
  1. Primer:
    - a. International Paint: Devprime 1409
    - b. PPG: Speedhide Interior/Exterior Rust Inhibitive Steel Primer 6-208.
    - c. S-W: Kem Bond HS
  
  2. Undercoat:
    - a. International Paint: Devlac 1432
    - b. PPG: DevGuard Alkyd Gloss 4309
    - c. S-W: Industrial Enamel HS
  
  3. Finish Coat:
    - a. International Paint: Devlac 1432
    - b. PPG: DevGuard Alkyd Gloss 4309
    - c. S-W: Industrial Enamel HS
  
- G. Zinc-Coated Metal: Full-Gloss, Alkyd-Enamel Finish, three coats.
  1. Primer:
    - a. International Paint: Devprime 1409b.
    - b. PPG: Speedhide Galv. Primer 6-209
    - c. S-W: ProIndustrial Pro-Cryl Universal Primer
  
  2. Undercoat:
    - a. International Paint: Devlac 1432
    - b. PPG: Dev Guard Alkyd Gloss 4309
    - c. S-W: Industrial Enamel HS
  
  3. Finish Coat:
    - a. International Paint: Devlac 1432
    - b. PPG: DevGuard Alkyd Gloss 4309
    - c. S-W: Industrial Enamel HS
  
- H. Concrete Masonry Units - Semi gloss Alkyd Enamel Finish: 2 coats over filled surface with total dry film thickness not less than 3.5 mils, excluding filler coat.
  1. Block Filler: High-Performance Latex Block Filler.

- |    |              |   |
|----|--------------|---|
|    |              | Speedhide Latex Block Filler 6-7.           |
| 2. | Undercoat:   | Interior Enamel Undercoat                   |
| 3. | Finish Coat: | Interior Semi-gloss Odorless Alkyd Enamel - |

### 3.12 MECHANICAL AND ELECTRICAL ITEMS

- A. The coating system shall be suitable for long term protection; expected life to first maintenance to be 15 to 20 years. The coating system and dry film thickness shall be suitable for the required performance considering the expected service life and environmental condition. Paints shall be applied so that an even film of uniform thickness, tint and consistency covers the entire surface, and is free of pin holes, runs, sags, bubbles, dry spray, cracking or other imperfections.
- B. Steel plate and all rolled steel sections including brackets and supports shall be given an application of cold phosphatizing compound before being prime coated.
- C. Prime Coat: Inorganic zinc silicate or red zinc chromate primer, 3 mils nominal dry film thickness.
- D. Intermediate and Top Coat: High-build epoxy/High build epoxy and epoxy enamel (interior); High build polyurethane (exterior).

### 3.13 CONCRETE FLOOR COATING:

#### A. SURFACE PREPARATION

- 1. Previously Painted Concrete: Old coatings and concrete must be in sound condition. Surfaces must be clean and dry and free of all contaminants such as laitance, dust, dirt, loosely adhering concrete, grease, or oil. Old coatings must be uniformly abraded, and concrete must have sufficient profile to achieve satisfactory adhesion of primer and top coat. Then, must also meet requirements for New/Bare Concrete.
- 2. New/Bare Concrete: The concrete surface shall be prepared to meet SSPC-SP 13/ NACE No. 6 Cleaning Method. In general, concrete must have sufficient profile to achieve satisfactory adhesion of primer and top coat. Concrete must be in sound condition and free of all coatings, curing compounds, oil, and other contaminants. New concrete must cure a minimum of 28 days prior to application of any coatings. Concrete can be abrasive blasted (ASTM D4259) or mechanically abraded to achieve a profile equal 60 grit sandpaper or coarser. Moisture vapor transmission should be 3 lbs. or less over 1000 sq. ft. area during a 24 hour period, measured and confirmed through a calcium chloride test (ASTM F1869). Concrete should have a minimum surface tensile strength of 300 psi verified by pull-off adhesion test. Consult the following ASTM methods: ASTM D4258 Standard Practice for Surface Cleaning Concrete for Coating, ASTM D4259 Standard Practice for Abrading Concrete, ASTM D4260 Standard Practice for Acid Etching Concrete and ASTM D4263 Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.

#### B. INSTALLATION

- 1. Install floor coating products strictly in conformance to manufacturer's recommendations and instructions.

#### C. CONCRETE FLOOR PAINT SCHEDULE:

The following products to be incorporated into the work include but are not limited to:

1. Station House, Platforms, Ramps, Walkways (Heavy Foot Traffic):
  - a. PPG Anti-Slip Safety Flooring Systems SFT 625 Heavy Pedestrian and Light Rolling Grade; or approved equal.
2. Vehicular Traffic/Equipment, Buses etc.:
  - a. PPG Anti-Slip Safety Flooring Systems SFT 650 Heavy Duty Grade; or approved equal.

END OF SECTION

SECTION 09 90 10  
CLEANING AND PROTECTIVE COATINGS  
OF EXISTING SURFACES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Unless noted otherwise, existing surfaces to be re-used shall be cleaned of old coating prior to re-coating. The Contractor should assume that all the existing coatings contain lead or other heavy metals unless otherwise noted in the documents, and all residue generated during the cleaning process shall be fully contained and properly disposed of. The Contractor shall determine if coatings in certain areas do not contain lead or other heavy metals by means of chemical and physical analyses approved by the Authority.
- B. The Contractor shall furnish all labor, materials, insurance, testing and cleaning equipment, including tools, receptacles, scaffolding, material for enclosures, and other necessary apparatus required to contain, clean, dispose of all lead-base and non-lead base paint and other material on structural steel, castings and other designated elements of the track structure, station, platform, canopy, and other designated elements of the rapid transit structures and facilities of the CTA rapid transit system at the locations specified herein to remain or be reused. This would include all elements of the historical stations designated to be re-used. Surface preparation, protective coating and top coating material shall be furnished and installed by the Contractor.
- C. Elements that are to remain or be reused that will require cleaning and protective coatings include, but are not limited to, the following:
  - 1. All surfaces and edges of all metal surfaces of the line structure members.
  - 2. The exposed top surfaces of top flanges and the top surfaces of lateral bracing on which platform timbers remain in place shall be cleaned and coated.
  - 3. In general, track ties and rail are to remain in place during this project. Exposed surfaces of track stringers, top surfaces of lateral bracing between stringers and top surfaces of cross girders are included in the cleaning and protective coating requirements of this project.
- D. Definitions:
  - 1. The term "bridge structure" as used herein shall include all structural members of the train carrying elevated structure and bridges, such as castings, cross girders, longitudinal girders, bridge girders, girders extensions trusses, floor beams, track stringers, any bracing steel foot walk supports, signal platforms and railings, etc., continuous from beginning to end of the Project.
  - 2. The term "cross girder" means a horizontal member supporting stringers or beams, and is a part of the line structure.
  - 3. "Abatement site" means the location of the site where the lead abatement operations are being performed by the Contractor.
  - 4. "Containment area" means the area established by the Contractor at an abatement site to demarcate the area where operations are being performed to abate lead.
  - 5. "Final clearance" means the approval given by an independent engineer after the lead abatement operations are completed.

6. "Lead" means all lead, lead-based products, lead-containing materials, lead-containing waste, or any goods, products, or structures containing lead, which are the subject of the lead abatement operations.
7. "Lead abatement operations" means operations performed by the Contractor to abate lead-based products, lead-containing soil and/or water, or those operations performed on the abatement site by the Contractor which are incidental to any of the above.
8. "Scheduled project" means lead abatement operations being performed by the Contractor at an abatement site commencing with the beginning date and terminating upon the completion date of the lead abatement operations, as reported on an "Application For Lead Abatement Specific Project Certificate of Insurance" for which the issuance of a Certificate of Insurance to the Contractor has been authorized by the Insurer.
9. "DFT" means dry film thickness.
10. "Workmanship": All work shall be performed in strict accordance with this specification and the coating manufacturer's current printed instructions and/or Tech data sheet for materials to be used on this project. Work shall be performed by skilled workmen in a safe and workmanlike manner. Application shall be in accordance with the principles of good workmanship described in SSPC-PA 1. Operators working on this project shall be qualified according to ASTM D4227 or ASTM D4228 or to the NACE International Guide to Qualification of Industrial Maintenance Painters.

E. Related Sections: The following sections contain requirements that relate to this Section.

1. Section 01 45 80 - Testing and Inspection Service.
2. Section 02 72 00 – Lead Abatement.
3. Section 05 10 30 - Structural Steel.
4. Section 09 90 00 - Painting.
5. Section 09 90 20 – Paint Testing.

### 1.03 QUALITY ASSURANCE

A. Codes, Regulations, Reference Standards and Specifications:

1. The latest editions of Codes and regulations of all local, state and federal jurisdictional authorities.
2. Steel Structures Painting Council (SSPC).
3. Society of Automotive Engineers (SAE): J 872, and grit values.
4. Environmental Protection Agency protection of Environment - 40 CFR
5. Occupational Safety and Health Standards for the Construction Industry (29 CFR Part 1926) with particular emphasis on Lead, Part 1926.62. Also, if applicable:
 

Inorganic Arsenic	29CFR 1910.1018
Cadmium	29 CFR 1926.1127
Chromium	29 CFR 1920.55
6. Illinois Department of Transportation (IDOT), 2002
7. Illinois Department of Public Health Lead Poisoning Prevention Code, 77 IL ADM, Code 845
8. City of Chicago Municipal Code, 11-4-2180.
9. ASTM B244, ASTM D714, ASTM D1212, ASTM D1730, ASTM D2092, ASTM D2200, ASTM D3359, ASTM D4138, ASTM D4212, ASTM D4214, ASTM D4227, ASTM D4228, ASTM D4262, ASTM D4285, ASTM D4414, ASTM D4417, ASTM

D5064, ASTM D6677, ASTM E337, ASTM F2170,

- B. Lead Abatement Liability Insurance: With respect to the coverage afforded under the lead abatement liability insurance policy, it is agreed that the following Paragraphs 1 through 9 are conditions precedent to coverage and are added to Contractors/Subcontractors Insurance Requirements, Part 3, Article 2 of the Contract.
1. Records: The Contractor is required to maintain written records for every scheduled project to show compliance with Conditions 2 through 9 below and to send the Authority, its designee and the Insurer copies of these records at such times as the Insurer may request
  2. Employee and Environmental Monitoring:
    - (a) Initial employee air monitoring must be conducted on each project to characterize the airborne lead (and also arsenic, cadmium, and/or chromium, if applicable) exposure of workers involved in different functions during abatement. Additional employee monitoring shall be conducted periodically throughout the project, and whenever abatement methodologies or job functions change. Frequency of monitoring shall be as dictated by governing regulations and/or OSHA.
    - (b) Environmental monitoring shall consist of continuous ambient air monitoring outside containment to demonstrate effectiveness of containment unit.
    - (c) The Contractor shall hire a third-party consultant (independent of the Contractor), for monitoring environmental issues and all employees. An Illinois Department of Public Health (IDPH) licensed lead inspector shall collect all samples.
  3. Sampling Requirements:
    - (a) Pre-abatement, abatement and final clearance sampling shall be conducted by an independent third-party consultant on every containment (including paint chip, wipe, air, soil and sediment sampling as deemed appropriate by the Authority). Soil, water and sediment sampling shall be conducted whenever soil or water is in the immediate vicinity of the abatement site.
    - (b) A lead abatement project shall be deemed to be in compliance if:
      - (1) Lead levels on horizontal surfaces shall be below 200 micrograms per square foot except floor areas shall be below 50 micrograms per square foot. All soil areas shall be below 400 parts per million (ppm).
    - (c) Methods of Sampling and Analyses:
      - (1) Employee air monitoring shall be conducted in accordance with National Institute for Occupational Safety and Health (NIOSH) analytical Method 7400 for Lead, Method 7048 for Cadmium, Method 7300 for Chromium, and Method 7900 for Arsenic as appropriate.
      - (2) Ambient air monitoring shall be conducted in accordance with 40 CFR Part 50, Appendix G, "Referenced Method for the Determination of Lead in Suspended Particulate Matter Collected from Ambient Air" and Appendix J "Reference Method for the Determination of PM10 in the Ambient Air". Results shall be available within 24 Hours of collection until a base line level is achieved.

- (3) All other sampling shall be conducted in accordance with accepted methodologies approved by the Authority.
  - (4) Use analytical methods for determination of lead content in paint (and other heavy metal) that are acceptable to the Authority. TCLP Waste Characterization sampling is not an acceptable method to determine the presence of lead in the structure's existing coatings.
  - (5) Soil, sediment, and groundwater sampling shall be conducted using the ASTM method SW-846 <sup>A</sup>Test Methods for Evaluating Solid Waste<sup>@</sup>.
- d. Analysis of Samples: All employee air samples shall be analyzed by an independent American Industrial Hygiene Association (AIHA) accredited laboratory, hired by the Contractor. All ambient air, wipe, soil, and other lead samples shall be analyzed by a qualified independent laboratory which holds the AIHA, American Association of Laboratory Accreditation (AALA) or other appropriate accreditation, or which is a contractor for inorganic analysis in the U.S. EPA Contract Laboratory Program (CLP).
- 4. Blood Lead Monitoring: Blood lead and Zinc Protoporphyrin (ZPP) level sampling and analysis in the form of blood sampling shall be made available to each employee exposed to lead above the OSHA action level.
  - (a) Monitoring of every site worker shall be conducted before the start of each project to establish baseline levels, at least every two months for the first six months thereafter until the project is completed, and upon termination of work from this project.
  - (b) All medical examinations and procedures shall be performed by or under the supervision of a licensed physician. Analysis of samples shall be performed by a laboratory using OSHA approved methods.
  - (c) Employees whose blood lead levels exceed 40 mg/dl shall be temporarily removed from the work area. A follow-up blood test shall be provided within two weeks after the employer receives the results of the first blood test. Employees exceeding 40 mg/dl shall be sampled at least every two months. This frequency shall continue until two consecutive blood samples and analysis indicate a blood level below 40 mg/dl.
- 5. Hygiene Facilities and Practices:
  - (a) Eating, drinking, smoking and applying cosmetics are not allowed in the work area. Any person leaving the work site or work area shall rinse his or her mouth with potable water and wash hands and face thoroughly before eating, drinking, or smoking. All individuals shall wash or shower before leaving the work site or work area at the end of a shift or at the end of the work day.
  - (b) A decontamination facility equipped with shower(s), lavatory(s), and potable water supply shall be provided on every job site. All hygiene procedures outlined in OSHA 29 CFR 1926.62 shall be followed unless the Contractor can demonstrate to the satisfaction of the Authority that the lead PEL (50 ug/m<sup>3</sup>) shall not be exceeded and upon approval of the Authority.
- 6. Signs: Signs, in accordance with 29 CFR 1926.62, including warning signs for other desired requirements stating "Caution, Lead Hazard - Keep Out" or "Warning – Lead Work Area – Keep Out", are to be utilized to identify encased, encapsulated or enclosed lead to warn others of the hazard. In addition, plans identifying the location of encased, encapsulated or enclosed lead shall be

prepared and submitted to the Authority with written notice of the hazards that may arise due to activities that may disturb or destroy the encasement, encapsulant or enclosure.

7. Conformance with Regulations: All lead abatement operations must conform to 29 C.F.R. 1926.62 and all other applicable federal, state, and local laws and regulations. In the event of a conflict between regulations and guidelines, the stricter regulation or guideline is to be followed, provided this will not result in a violation of the regulations.
8. Containment Negative Pressure: All lead abatement operations, including clean-up, shall be conducted in containment under a negative differential air pressure as described in Section 3.03 A of this specification.
9. Personnel Training: All employees working on this project shall have completed the Illinois Department of Public Health (IDPH) approved Lead Workers Training Program and receive training as specified in 29 CFR 1926, 40 CFR 265 and any other applicable federal, state and local codes or regulations and pass the examinations administered at the conclusion of the courses. If the initial classes were taken more than three years prior to the project, the lead worker must submit a current refresher class certification.

C. Coordination with other Agencies or Entities:

1. Illinois Department of Transportation (IDOT) and local municipalities.
2. CTA forces working in the project area.
3. Other contractors working in the project area.

D. Permits:

1. Contractor must obtain all required local permits and approvals. Work in the City of Chicago requires a permit and notification to all residents and businesses within 75 feet of the abatement project.

E. The painting contractor must be certified and approved by the manufacturer(s) of the coating materials as qualified for the installation of their products.

1.04 SUBMITTALS:

A. Submit the following for approval by the Authority in accordance with the General and Special Conditions and with the additional requirements as specified:

B. Coating Materials

1. The coating manufacturer's current printed technical data for the proposed coatings. The technical data submittal shall include all coating properties pertinent to the specifications outlined in Sections 2.2 and 2.3 as well as material safety data sheets for all coatings, solvents and any other material being used by the Contractor and Sub-Contractors on this project.
2. The coating manufacturer's current printed instructions for application of the coatings.
3. Field History of Epoxy-Mastic Coating: Submit documentation by the coating manufacturer verifying successful use of the epoxy-mastic coating in the field. The coating shall have been successfully used on at least ten (10) projects which required at least 100 gallons per project. The performance history shall also be for a minimum of three (3) years in a similar environment as the intended use.
4. Warranty: Provide a written warranty, in a form acceptable to the Authority, from the coating manufacturer, countersigned by the applicator, stating that the system provided is as specified and any defects due to materials and/or workmanship shall be repaired and/or replaced at no cost to the Authority for a period of three



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5. (3) years from time of final acceptance by the Authority.  
The coating manufacturer's certification that the products in a multi-layer coating system are appropriate for the intended use, and are compatible with each other and with project substrates.
6. Color Samples: Submit a color chip chart from the coating manufacturer for selection of colors for topcoat. The Authority shall prepare a schedule locating color placement in the project. Up to five (5) colors may be selected.
7. Samples for verification purposes: Provide samples of each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate. Resubmit until required gloss, colors, and textures are achieved.

C. Hazardous Waste and Pollution Control:

1. Documentation verifying that arrangements for the transport and disposal of special waste (including hazardous waste), contaminated materials and supplies have been made, including the name and location of the disposal site, and a copy of the handling procedures. Certification that all these elements comply with all local, state, and federal laws and regulations in effect at the time of execution of the Contract shall be required in writing.
2. The Contractor shall furnish proof that employees have successfully completed a training program as specified in 29 CFR 1926, 40 CFR 265, and all other applicable federal, state and local codes and regulations.
3. Submit a copy of the application to the Illinois EPA or applicable local and state agency for permission to haul special waste (including hazardous waste) to the disposal site. The Contractor shall submit for the Authority's approval the name, address, phone number, state and federal operating permit ID numbers for each special or hazardous waste transporter and disposal facility to be used on this project. A list of CTA approved disposal sites can be obtained from the Authority.
4. The Contractor shall provide completed manifests ready for signature to the Authority. The Manager of Health and Environmental shall sign the manifests.
4. Provide copies of all abrasive blasting permits issued by local agencies.
5. A copy of the Site Specific Safety and Health Plan for lead paint removal developed for this project shall be submitted two weeks prior to the start of sandblasting. This plan shall be approved by the Authority prior to the start of sand blasting. The Site Specific Safety and Health Plan shall cover all site worker's activities for lead abatement and application of new coatings and shall include as a minimum: work objective, personnel protective procedures by task and zone, work hazards, project organizational structure, employee training, medical surveillance program, work procedures and practices, air monitoring and environmental sampling protocol, decontamination procedures, site emergency plan, and all regulations applicable to this project.
6. A copy of the Contractor Contingency Plan shall be submitted two (2) weeks prior to the start of the work. The plan shall follow the Illinois Department of Transportation plan for lead removal projects entitled: "Hazardous Waste Contingency Plan for Lead Based Paint Removal Projects" (IDOT Form 5843I). Contractor shall also submit to the Authority copies of notification letters to local police, fire departments and hospital facilities to inform them of the project. Projects within the City Limits of Chicago require notification to all businesses and residents within 75 feet of all work areas.
7. The written air monitoring program shall be submitted two (2) weeks prior to the start of the work and include the name(s) of the air monitoring technician(s) appointed and his (their) qualifications, types of equipment and materials proposed, and the testing laboratory proposed. An independent third-party consultant shall conduct this written program and all employee and environmental air monitoring.

- D. Lead Abatement Plan: A written job specification for the lead abatement plan shall be prepared and submitted two (2) weeks prior to the start of the work. This plan must be approved by the Authority prior to the start of the work.
  - 1. This plan shall include drawings of the arrangement and type of material to be used for the containment, size of the containment, hygiene facilities, location of the negative air machine, and procedures for the collection, temporary storage, transportation and disposal of the blasting debris.
  - 2. All details for the Lead Abatement Plan shall be submitted to the Authority in the form of Drawings and Specifications and shall be approved prior to the start of work. The plan should provide detailed information regarding the method of containment, the containment structure design, method of recycling blast abrasive, the hazardous waste temporary storage and disposal system, equipment specifications, and all other pertinent information related to the pollution control plan. The decision of the Authority as to the acceptability of the plan shall be final. However, approval of the plan by the Authority shall in no way relieve the Contractor of his obligation to supply and maintain a pollution control plan in full compliance with this Specification and all government agency regulations.
- E. Employee Medical Qualification Forms: Submit certification of employee medical examination by a qualified occupational physician and respirator fit testing results for each employee who works on this project. These documents shall be current, within one year from the commencement of this project. No employee shall be permitted to operate on this project unless this documentation has been submitted and copies kept at the site.
- F. All of the above shall be in full compliance with all laws, regulations, etc. in effect at the time of Contract execution.
- G. Test Methods: Prior to beginning lead abatement work, the Contractor shall submit for approval by the Authority, test methods for determining the presence of lead and the heavy metals arsenic, cadmium and chromium, and their content in existing coating.
- H. Abrasive Certifications: Submit manufacturer's written certification that abrasive blasting materials comply with specifications. Independent laboratory sample analysis shall be conducted to determine if the new abrasive contains lead, arsenic, cadmium and/or chromium.
- I. Enclosure: Submit Blast Enclosure Construction Details and Method of maintaining Negative Pressure.
- J. Warranty: Provide a copy of the written warranty, in a form acceptable to the Authority, from the coating manufacturer, countersigned by the applicator, stating that the system provided is as specified and any defects due to materials and/or workmanship shall be repaired and/or replaced at no cost to the Authority the specified time period.
- K. "NACE Coating Inspector Level1- Certified" current certification of the paint inspector.
- L. Process Plan: Provide a detailed process plan for each material being coated explaining each step of coating process, including, but not limited to:
  - 1. Surface preparation and verification with specification.
  - 2. Primer application and verification with specification.
  - 3. Finish coat(s) application and verification with specification.
  - 4. How testing is incorporated into the above process plans per Section 09 90 20 of these specifications.

## 1.05 WARRANTY

- A. All painting work and the painting system shall be warranted by both the manufacturer(s) of all the materials and the installer(s) of all the materials to not fail in adhesion, color retention, gloss retention, chalking, cracking, fading, peeling, blistering, indicating evidence of rust, lack of protection of the surface or other malfunction as determined herein. The warranty shall include a statement that the substrate has been examined by the parties involved and that it was in proper condition or prepared properly for application of the specified coating system. The warranty shall also include a statement indicating that the specified coating system is compatible with the substrate, the various coatings specified, the conditions under which the system will be applied and the conditions under which the system will be used to protect the substrate.
  - 1. For previously painted substrates, the warranty for the new coating system shall be three (3) years from the date of final acceptance by the Authority.
  - 2. For new substrates, the warranty for the coating system shall be for ten (10) years from the date of final acceptance by the Authority.
- B. Painting systems that fail within the specified warranty periods shall be replaced by preparing the surfaces and re-applying according to manufacturer's directions and the Authority's approval. The extent of re-application shall be determined by the Authority. The work shall be done at no cost to the Authority for materials or labor.

## PART 2 PRODUCTS

### 2.01 ABRASIVE FOR BLAST CLEANING:

- A. Disposable, clean, non-conductive abrasive.
  - 1. Commercially available crushed slag capable of producing a blast cleaned surface with a profile of 2-3 mils and with a minimum of residual embedment.
- B. The abrasive shall be non-conductive in the vicinity of the existing wood ties or power distribution cables which are to remain. Non-conductive abrasive shall not be reused.
- C. Abrasive type and size shall ensure maximum allowable profile height for a particular coating application. The abrasive should be clean and dry and selected as appropriate. Profile height is to be measured by an Elcometer 224 Model T Digital or similar Surface Profile Gauge.
- D. Calcium Silicate Abrasive Additive for lead abatement (Optional):
  - 1. Particle size distribution of at least 95% greater than 50 mesh and less than 12 mesh.
  - 2. Bulk density of greater than 80 pounds per cubic foot and less than 100 pounds per cubic foot.
  - 3. Hardness greater than 60 on the Mohs scale.
  - 4. Must be capable of rendering leachable lead in the untreated spent abrasive wastes from up to 100 mg / 1 to less than 5.0 mg / 1 (non-hazardous) according to the TCLP.
  - 5. Must not be a hazardous material under the US OSHA Hazard Communication Standard.
  - 6. Must not create an additional work place health hazard as defined by the US OSHA Hazard Communication Standard.
  - 7. Must be approved for use without RCRA (or equivalent) treatment permit by State Environmental Officials.
- E. All equipment required for blast cleaning operations including air compressors shall be

supplied and maintained by the Contractor. Compressors shall be of adequate size and in good repair. Compressed air shall be free of oil and water and shall have a minimum working pressure of 180 inches of mercury.

- F. Surface salts: Where a surface shows discoloration within a short time after blast cleaning, this is an indication that the surface contains salt which will be detrimental to the coating. Under these circumstances, the surface shall be thoroughly washed with fresh water, dried and re-blasted. If necessary, the procedure may need to be repeated for as many times as are necessary.

## 2.02 GENERAL FOR COATINGS

- A. The coating system described herein provides for a self-priming, two-part aluminum pigmented epoxy mastic protective coat and an aliphatic acrylic urethane top coat. Contractor shall furnish all coating materials. The Authority reserves the right to select the colors (Federal Standard Colors).
- B. The same manufacturer shall supply all products in a multi-layer coating system. The coating manufacturer shall certify that the products are appropriate for the intended use and are compatible with each other.
- C. All coatings used for this project to be lead-free.

## 2.03 PROTECTIVE COAT-EPOXY MASTIC

- A. Protective Coat: 3-5 mils dry film thickness over galvanized steel and 7-11 mils dry film thickness for non-galvanized steel, Self-priming, two-component, modified epoxy mastic, aluminum pigment. The epoxy mastic shall be a one (1) coat, high-build complete protective coating system certified by the manufacturer as being appropriate for use over marginally prepared rusted, pitted and coated steel surfaces. It shall be supplied as two-part material with a one-to-one volume mix ratio, and shall be well ground and not caked, skinned or substantially settled in the container.
- B. Composition
  1. Pigment: The pigment shall be leafed aluminum. Secondary pigments shall be rust-inhibiting and adhesion-promoting types.
  2. Vehicle: The vehicle shall be of the epoxy-type modified with bitumen like substance. The curing agent shall have suitable insensitivity to moisture to allow trouble-free application during normal humidity conditions.
  3. The epoxy mastic shall contain 90% minimum solids by volume, tested according to ASTM D3960 modified to a dry time of seventy-two (72) hours at 100 degrees F rather than three (3) hours at 105 degrees F.
  4. The shelf life of the epoxy mastic components shall be no shorter than twelve (12) months, so that no caking of fillers, skins or gelatin occurs.
  5. Viscosity: Component A and Component B shall be mixed viscosity of 110-140KU, at 75 Degrees F plus or minus 2 degrees F.
  6. The Volatile Organic Compounds (VOC) shall not exceed 340 g/L (2.8 lb/gal) as applied when tested according to ASTM D 3960.
- C. Mixing: No partial containers shall be mixed and mixing shall be accomplished by the use of air driven stirrers.
- D. Properties of Mixed Paint
  1. The epoxy mastic shall air cure at temperatures of 75 Degrees F or above to a hard and tough film within five (5) days by evaporation of solvent and chemical

- reaction. At 75 Degrees F, it shall be dry to the touch within twenty-four (24) hours, and able to receive foot traffic within forty-eight (48) hours.
  2. The pot life of the epoxy mastic shall not be shorter than four (4) hours at 75 Degrees F, un-thinned.
  3. The mixed paint weight per gallon shall be 10.2 pounds minimum at 75 Degrees F plus or minus 2 Degrees F.
  4. Film Build: The catalyzed mixture, thinned 10% by volume with the manufacturer's recommended thinner, shall be capable of being applied at 10 mils wet film thickness without exhibiting runs or sags.
- E. Test Panel Preparation: the test panels shall be steel, having dimensions of 2" x 5" x 1/8" or as otherwise required by ASTM D 609 specification. The panels shall have coating surfaces prepared by abrasive blasting in accordance with NACE No. 1/SSPC-SP5, White Metal Blast Cleaning, with a surface profile of 1-2 mils after which they shall be exposed to Midwest weather for thirty (30) days so that a uniform rusting occurs. They shall then be hand-cleaned with a wire brush in accordance with SSPC-SP2 specification. Test panels shall then be coated and cured with epoxy mastic as follows: The epoxy mastic shall be spray applied to the steel panels at 5 mils dry film thickness in one (1) coat. The coating shall be cured as recommended by the manufacturer. Unless otherwise noted, panels shall then be scribed down to the substrate metal with an "X" of at least two (2) inch legs prior to being subjected to resistance testing.
- F. Test Requirements: The epoxy-mastic manufacturer shall provide test data acceptable to the Authority demonstrating that the epoxy-mastic coating system has been subjected to, and has successfully performed in testing equal in severity to the following tests:
1. Flexibility Test: ASTM D552. The panel shall be sandblasted in accordance with SSPC-SP 5-63 Specification.
  2. Temperature Cycling Test: ASTM D2246 (15 cycles).
  3. Weathering Resistance Test: ASTM G53 (1000 cycles).
    - a. The coated and scribed panels shall then be exposed to ultra-violet and condensation exposure as outlined in the specification for the total exposure period.
    - b. Upon examination after 1000 hours of exposure, the panels shall be unaffected except for discoloration of the epoxy-mastic coating. There shall be no blistering, softening or visible rusting on the coating beyond 1/16" from the center of the scribe marks.
  4. Fresh Water Resistance Test
    - a. The coated and scribed panels shall be immersed in fresh tap water at 75 Degrees F. plus or minus 5 Degrees F.
    - b. Upon examination after thirty (30) days immersion, the panels shall be unaffected except for discoloration of epoxy-mastic coating; there shall be no blistering, softening or visible rusting on the coating beyond 1/16" from the center of the scribe marks.
  5. Salt Water Resistance Test
    - a. The coated and scribed panel shall be immersed in 5% sodium chloride solution at 75 Degrees F. plus or minus 5 Degrees F. for a period of 30 days.
    - b. The panels shall be unaffected except for discoloration of the epoxy-mastic coating upon inspection after 7, 14, and 30 days. There shall be no blistering, softening or visible rusting on the coating beyond 1/16" from the center of the scribe marks. The sodium chloride solution shall be

replenished after each examination.

6. Salt Fog Resistance Test

- a. The coated and scribed panels shall be tested in a salt fog cabinet using 10% synthetic sea salt solution.
- b. After 1,000 hours of continuous exposure, the coating shall show no loss of bond, nor shall it show rusting or blistering beyond 1/16" from the center of the scribed marks.

7. Gloss Test

- a. The standard for measuring gloss level is ASTM D523, "Standard Test Method for Secular Gloss" of 70 degrees and above.

G. Packaging and Labeling

1. The epoxy-mastic coating shall be packaged in two (2) containers, labeled Part A and Part B. The components shall be packaged in such proportions that the Part A when mixed with the Part B will yield ten (10) gallons of mixed paint. Each container shall bear a label on which shall be clearly shown the manufacturer or brand name of the coating, the batch or lot number and the date of manufacture. No partial containers shall be mixed and mixing shall be accomplished by the use of air driven stirrers.
2. The label on the vehicle container shall also include complete instructions for the use of this coating. The container shall be coated if necessary to prevent attack by the coating components.

H. The following, or equal products approved by the Authority, are acceptable for the protective coating material:

1. Carboline – Carbomastic 15/Carbomastic 615 Al (Low Temp)
2. International Paint - Interseal 670 HS
3. PPG – Amerlock 2/400 Epoxy Mastic Aluminum
4. Sherwin-Williams – Epoxy Mastic Aluminum II

2.04 TOP COAT

A. Aliphatic Acrylic Urethane, 2 mils minimum dry film thickness, for the purposes of ultraviolet protection and aesthetics. Color shall be high gloss CTA colors matching Color Numbers of the Federal Standards or such colors as designated by the Authority. The Authority may select up to five (5) colors for various locations and elements. Urethane shall have the same field history as required in 1.04, B, 3.

B. The following, or equal products approved by the Authority, are acceptable for the protective coating material:

1. Carboline – -Carbothane 133 H/B Urethane Finish
2. International Paint – Interthane 990HS
3. PPG – Amercoat 450H Acrylic Polyurethane Gloss
4. Sherwin-Williams – Corothane II

PART 3 EXECUTION

3.01 GENERAL

A. Work shall be conducted over contiguous work areas to permit systematic and continuous

cleaning and coating operations.

- B. Provide the necessary equipment and operator, which may include truck-mounted manlifts, bucket trucks or other approved equipment suitable to the Engineer, which will permit the Authority to inspect the cleaning and coating operations, both inside and outside of the containment. The equipment shall be in good, clean and safe working condition at all times, and shall be available for the Authority's use at all times, including night and weekend work, whenever work is performed.
- 5. Properly protect all adjacent surfaces not to be cleaned and refinished including walls, glazing, gaskets, caulking, fixtures, etc. from damage during the cleaning and finishing operations with masking and materials that will not deteriorate during the cleaning operations.
- C. Provide intrinsically safe artificial lighting in areas where natural illumination is inadequate, as determined by the Authority, to allow proper cleaning, inspection, and painting. Illuminance surrounding blasting and painting work shall be at least 30 foot-candles. Illuminance of the working platforms, access and entry shall be at least 20 foot-candles.
- D. At no time during the execution of the work shall the Contractor employ less than six (6) workers at one location without approval of the Authority.
- E. No blasting work shall be conducted when the steel substrate surface temperature is less than 5 degrees F. above the dew point.
- F. All cleaned surfaces to be coated shall be inspected, in accordance with the inspection requirements outlined in the Contractor's Quality Program as specified and accepted by the Authority before any coating is applied.

### 3.02 CLEANING OF SURFACES:

- A. General: The Contractor shall determine if coatings in certain areas do not contain lead by means of chemical and physical analysis subject to approval by the Authority. Unless the existing coatings are determined to be non-hazardous or indicated to remain, one hundred percent (100%) of all surfaces to be coated shall be cleaned by the appropriate method as described below and as approved by the Authority.
- B. The Contractor shall completely remove all existing coatings unless indicated otherwise. The Contractor shall assume that all existing coatings contain lead, arsenic, cadmium, and/or chromium unless determined otherwise. Laboratory analysis of the samples is required and all residue generated during the cleaning process shall be fully contained and properly disposed of as hazardous waste.
  - 1. The Contractor shall provide a schedule of specific existing surfaces and their respective method of cleaning proposed, for the Authority's approval.
  - 2. Prior to blast cleaning, all visible grease and oil shall be cleaned and removed with a solvent acceptable to the Authority in accordance with SSPC SP 1.
  - 3. Dry abrasive blast cleaning shall be used for all cleaning methods, to class 2 (Near White metal blast cleaning). The Contractor shall use proper blasting equipment and use oil-free and moisture-free compressed air.
  - 4. Particular attention shall be paid to joints, angles, pits and weld areas to ensure that the treated surface is brought to the standard required.
  - 5. After blasting, all dust and loose matter shall be removed from the surfaces. All dust and grit shall be removed from pockets and corners using dry compressed air. The steel shall not be allowed to rust or be contaminated in any way before coating. Rust formed after cleaning shall be removed by re-blasting prior to coating. All surfaces shall be thoroughly cleaned and dried to the satisfaction of

- the Authority and the coatings applicator before any coating is applied. Operators shall wear clean gloves when handling the steel.
6. All work cleaned on one day shall be prime coated on that day before the dew point is reached and before any contamination or discoloration of the surface can take place. However, in any case, coating shall be applied within twenty-four (24) hours of blast cleaning, unless directed otherwise by the Authority. Any blasted area not coated within the above specified period shall be re-blasted to the satisfaction of the Authority before coating application.
  7. The Contractor's representative shall ensure that weather conditions, wind borne dust, non-availability of labor or equipment do not prevent the application of a priming coat within the prescribed period.
- C. Where existing coatings are approved by the Authority to remain, the existing coatings must be secure, in good condition, and determined and approved to be compatible with the new coating system. Where peeling coatings are encountered, the Contractor shall remove the peeling layer in its entirety not only at the peeling locations, but the entire member or surface where ever that layer is detected.

### 3.03 CLEANING METHODS

- A. Method #1 Cleaning (dry abrasive blasting in enclosure, containment and disposal):
1. Method #1 Cleaning is a method of preparing steel surfaces which is to be in accordance with NACE No. 3/SSPC-SP 6 Commercial Blast Cleaning and be a visual match when compared to SSPC VIS 1 for SP 6 cleaned surfaces and, when viewed without magnification, shall leave the cleaned surface free of all visible oil, grease, dirt, dust, mill scale, rust, coating, oxides, corrosion products, and other foreign matter except for staining. Random staining shall be limited to no more than thirty-three percent (33%) of each unit area approximately 9 square inches (i.e. a square (3in x 3in)) and may consist of light shadows, slight streaks of minor discolorations caused by stains of rust, stains of mill scale, and stains of previously applied coating. Acceptable variations in appearance that do not affect surface cleanliness include variations caused by type of steel, original surface condition, thickness of steel, weld metal, mill or fabrication marks, heat treatment, heat-affected zones, blasting abrasive, and differences in the blast pattern. Blast profile shall be 1.0 mil minimum, 1.5 mils maximum.
  2. Hazardous waste containment and control procedures shall be utilized for lead-based paint removal.
  3. Rust formed after cleaning shall be removed by re-blasting prior to coating. Dust from blasting shall be removed from cleaned surfaces by brushing, vacuum or blow-off with clean dry air prior to coating.
  4. The maximum time allowed between cleaning and application of prime coat shall be twenty-four (24) hours. Under no circumstances shall steel exhibit visual evidence of rusting before coating regardless of time elapsed.
  5. No blasting work shall be conducted when steel surface temperature is less than five (5) Degrees F above the dew point or the relative humidity is above 85%.
- B. Method #2 Cleaning (Wet Abrasive blasting with containment and disposal):
1. Method #2 Cleaning is a method of preparing steel surfaces which, when viewed without magnification, shall leave the cleaned surface free of all visible oil, grease, dirt, dust, mill scale, rust, coating and other foreign materials. Generally, evenly dispersed very light discoloration caused by stains of rust, stains of mill scale or stains of previously applied coatings may remain on no more than thirty-three percent (33%) of each unit area approximately 9 square inches (i.e. a square (3in x 3in)). The Contractor shall completely remove all existing coatings.



- Blast profile shall be 1.0 mil minimum, 1.5 mils maximum.
2. Hazardous waste containment and control procedures shall be utilized for lead-based paint removal.
3. Rust formed after cleaning shall be removed by re-blasting prior to coating.
4. After wet blasting, rinse cleaned surface to remove spent abrasives with fresh water to which sufficient corrosion inhibitor has been added to prevent rusting, or with fresh water followed by an inhibitor treatment. Supplement this cleaning by brushing if necessary to remove any residues.
5. The use of inhibitors or the application of coating over slight discoloration should be in accordance with the requirement of the coating manufacturer.
6. The maximum time allowed between cleaning and application of prime coat shall be twenty-four (24) hours. Under no circumstances shall steel exhibit visual evidence of rusting before coating regardless of time elapsed.
7. No blasting work shall be conducted when steel surface temperature is less than 5 degrees F above the dew point.

C. Method #3 Cleaning (Ultra High Pressure Water Wash NACE No. 5/SSPC-SP12 with containment and disposal):

1. Method #3 Cleaning is a method of preparing steel surfaces which, when viewed without magnification, shall leave the cleaned surface free of all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose coating. Mill scale, rust and coating are considered adherent if they cannot be removed by lifting by a dull putty knife or cracked off by impact a hand chipping hammer.
2. The standards established by Visual Surface preparation definition WJ-1 and non-visual surface preparation definition SC-1 of SSPC-SP 12 shall be satisfied.
3. As part of surface preparation, deposits of oil, grease and foreign matter must be removed by ultrahigh-pressure water jetting, by steam cleaning with detergent, by methods in accordance with SSPC-SP 1 or by another method approved by the Authority.
4. It is necessary to use an inhibitor that prevents rust forming after rinsing. The use of inhibitors or the application of coating over slight discoloration should be in accordance with the requirement of the coating manufacturer.

D. Method #4 Power Tool Cleaning to Bare Metal (SSPC-SP 11):

1. Power tool cleaning to bare metal shall produce a bare metal surface and be a visual match when compared to SSPC VIS 3. The surface must be roughened to a degree suitable for the coating system specified in this specification, with a profile not less than 1 mil, and when viewed without magnification the cleaned surface shall be free of all visible oil, grease, dirt, dust, mill scale, rust, coating, oxide, corrosion products, and other foreign matter. Slight residues of rust and coating may be left in the bottom of pits if the original surface is pitted.
2. Areas inaccessible for cleaning by power tools shall be cleaned by "Hand Tool Cleaning" as outlined in Method #6.
3. After power tool cleaning is completed, dust and other loose matter shall be removed from the surface.
4. Hazardous waste control procedures shall be utilized for lead based paint removal.

E. Method #5 Solvent Cleaning (SSPC-SP 1):

1. **This step must be done before any other surface preparation can proceed.**
- 2.. Solvent Cleaning is a method for removing all visible grease, oil, dirt, soil, drawing and cutting compounds, and other soluble contaminants from steel surfaces.

Solvent cleaning does not remove rust or mill scale. Change rags and cleaning solution frequently so that deposits of oil and grease are not spread over additional areas in the cleaning process. Be sure to allow adequate ventilation.

F Method #6 Hand Tool Cleaning (SSPC-SP 2):

1. Hand tool cleaning shall be used where applicable; using hand brushing, hand sanding, hand scraping, hand chipping or combined methods to remove loose millscale, loose rust, loose coating and other detrimental foreign matter. Mill scale, rust, and coating are considered adherent if they cannot be removed by lifting with a dull putty knife. After hand tool cleaning is completed, dust and other loose matter shall be removed from the surface.

G Method #7 Cleaning (dry Brush-Off Blast cleaning, non-lead-based paint):

1. Method #7 Cleaning is a method of preparing steel surfaces which is to be in accordance with NACE No. 4/SSPC-SP 7 Brush-Off Blast Cleaning and, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose coating. Tightly adherent mill scale, rust, and coating may remain on the surface. Mill scale, rust, and coating are considered tightly adherent if they cannot be removed by lifting with a dull putty knife. The entire surface shall be subjected to the abrasive blast. The remaining mill scale, rust, or coating shall be tight. When painting is specified, the surface shall be roughened to a degree suitable for the specified coating system. Immediately prior to coating application, the surface shall comply with the degree of cleaning as specified herein.

H. Method #8 Near-White Metal Blast Cleaning (NACE No. 2/SSPC-SP 10):

1. Method #8 Cleaning is a method of preparing steel surfaces which when viewed without magnification, shall be free of oil, grease dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other foreign matter except for staining. Staining shall be limited to no more than 5% of each unit area of surface approximately 9 square inches (i.e. a square (3 in x 3 in)) and may consist of light shadows, slight streaks or minor discolorations caused by rust, mill scale, and previously applied coatings.

I. Method #9 Cleaning (shrouded vacuum blasting without enclosure, lead paint containment and disposal):

1. Method #9 cleaning is utilized if and only if it is specifically allowed by CTA. Method #9 cleaning is a method of preparing steel surfaces using mechanical self-containing shrouded vacuum blasting equipment so as to remove and contain the blasting residue and removed paint without need for a separate enclosure. No surface is to be blasted if shrouds are not in contact with the steel surface. The prepared surface is to be in accordance with NACE No. 3/SSPC-SP 6 Commercial Blast Cleaning and be a visual match when compared to SSPC-VIS 1 for SP 6 cleaned surfaces and, when viewed without magnification, shall leave the cleaned surface free of all visible oil, grease, dirt, dust, mill scale, rust, coating, oxides, corrosion products, and other foreign matter except for staining. Random staining shall be limited to no more than thirty-three percent (33%) of each unit area of surface approximately 9 square inches (i.e. a square (3 in x 3 in)) and may consist of light shadows, slight streaks of minor discolorations caused by stains of rust, mill scale, and previously applied coatings. The Contractor shall completely remove all existing coatings. Acceptable variations in appearance that do not affect surface cleanliness include variations caused by type of steel, original surface condition, thickness of steel, weld metal, mill or

- fabrication marks, heat treatment, heat-affected zones, blasting abrasive, and differences in the blast pattern. Blast profile shall be 1.0 mil minimum, 1.5 mils maximum.
2. Hazardous waste containment and control procedures shall be utilized for lead-based paint removal.
3. Rust formed after cleaning shall be removed by re-blasting prior to coating. Dust from blasting shall be removed from cleaned surfaces by brushing, vacuum or blown-off with clean dry air prior to coating.
4. The maximum time allowed between cleaning and application of prime coat shall be twenty-four (24) hours. Under no circumstances shall steel be permitted to rust before coating regardless of time elapsed.
5. No blasting work shall be conducted when steel surface temperature is less than five (5) Degree F above the dew point.
6. The Contractor, when authorized by the Authority, may utilize Method #9 Cleaning in lieu of Method #1 Cleaning in order to achieve the project milestones, or at specific locations requiring unrestricted access to adjacent businesses.

### 3.04 SURFACE PREPARATION

- A. Cleaning Structural Steel: All steel structure defined in this contract to be cleaned shall be cleaned by using Method #1, except as follows:
  1. Hand Tool Cleaning (SSPC-SP 2) or Power Tool Cleaning (SSPC-SP 3) may be used as supplement to Method #1 Cleaning for top surface of track stringer, cross girder and top lateral bracing between the track ties and top surfaces of track thru girders.
  2. The Contractor, when authorized by the Authority, may utilize Method #4 Cleaning as a supplement or in lieu of Method #1 Cleaning at no additional cost to the Authority.
  3. A modified Method #1 Cleaning procedure involving less stringent waste containment and disposal controls may be utilized when the Contractor demonstrates to the satisfaction of the Authority that the coating to be removed does not contain lead, arsenic, cadmium, and/or chromium.
- B. Cleaning Architectural and Miscellaneous Structural Elements: All existing coatings to be removed shall be removed by using Method #1 Cleaning, except as follows:
  1. All surfaces not accessible with ladders or requiring access from or above track level may be cleaned using Method #2 (wet abrasive blasting) upon approval by the Authority.
  2. All other Station Architectural Elements may be cleaned using Method #3(High Pressure Water Wash). The Contractor is responsible for using a filtration system in all drainage areas during all High Pressure Water Wash. In addition, the Contractor shall employ Cleaning Method #6 (hand tool cleaning) or Cleaning Method #4 (power tool cleaning) or a combination of the two, where required to satisfactorily remove existing coatings and rust.
  3. All exterior metal railings adjacent to roadways and on bridges and bridge supports, shall be cleaned using Cleaning Method #1 (dry abrasive blasting with enclosure) or #2 (wet abrasive blasting). The Contractor shall completely remove all existing coatings.
  4. All galvanized metal surfaces shall be cleaned of dirt and grease using cleaning method #5 (Solvent Cleaning) prior to using cleaning method #6 (Hand Tool Cleaning) and cleaning method #4 (Power Tool Cleaning). Extra care shall be exercised with perforated surfaces.
  5. All wooden surfaces shall be thoroughly cleaned using Cleaning Method #6 (Hand Tool Cleaning) and the surfaces shall be sandpapered with coarse, medium, and fine sandpaper to a smooth, even and uniform surface. Remove

- sanding dust from entire surface using air pressure before first coat is applied.
6. All painted concrete surfaces shall be cleaned using Cleaning Method #3 (High Pressure Water Wash). The Contractor is responsible for using a filtration system in all drainage areas during all cleaning operations.
- C. Test Area: The Contractor shall, at the Contractor's own expense, clean minimum two-foot by two-foot area of the structure for each cleaning method to be utilized. After inspection and acceptance of the cleaned sample by the Authority, the sample shall become the standard for the remainder of this project. The Contractor shall, immediately upon acceptance, provide a clear protective coating to preserve these samples in their conditions as approved. Upon completion of the project, the test area shall be re-blasted and coated in accordance with this Specification.
- D. Removal and Restoration of Attachments: Prior to commencement of cleaning work, station signs, advertisements and other attachments, including traffic and street lights that interfere with cleaning operations shall be removed by the Contractor without damage and stored in locations approved by the Authority. The Contractor shall be responsible for inventorying, storing and protecting all removed items. Upon completion of the coating work, only such items designated by the Authority shall be reinstalled by the Contractor; all other items shall be delivered to the Authority's storage location as designated by the Authority.
- E. Any adjacent surfaces, railroad ties, wires, cables or other appurtenances that must remain in close proximity to blast cleaning or subsequent coating operations shall be suitably protected by the Contractor to avoid damage from these operations. These items shall not be painted. Contractor will be held liable for any damage done to cables, wires or other appurtenances that remain in close proximity.

3.05 HAZARDOUS WASTE DISPOSAL AND POLLUTION CONTROL:

- A. Containment:
1. As a minimum requirement, the Contractor shall completely enclose the structure being blast-cleaned during all blasting operations and maintain the enclosure at a negative pressure relative to ambient of 0.3 inches water column. Negative pressure relative to ambient of 0.3 inches water column shall be maintained throughout the enclosure. The Contractor shall confirm daily with a manometer that the negative pressure requirement is maintained throughout the enclosure. The enclosure shall be constructed of a rigid support with positive joint seal. The material used as a cover shall be impermeably equivalent to 6-mils-thickness of polyethylene. A clearly marked, securable opening for ingress and egress shall be provided having minimum dimensions of 2' x 6'. The negative pressure system shall use HEPA filters and shall operate continuously, 24 hours a day, at the start of the lead abatement work through clean-up.
  2. The blast enclosure shall have a complete ground cover which shall be sealed to the side and end closures to prevent any leakage of contamination. The ground cover shall be non-permeable, shall withstand vehicle movement and not tear by shoveling/scooping or other means of cleaning the waste. Plastic covers are not acceptable within 12 inches of any item which will be sandblasted.
  3. The Contractor shall thoroughly clean the interior of the blast enclosure at the end of each work day and properly handle all waste as herein specified. Dust collected on the floor following abrasive air blasting shall not be removed by blowing with compressed air, brushing, broom, or by any other method that would re-suspend residues in the air. All dust and residue generated during the cleaning process shall be removed by HEPA vacuuming equipment.
  4. All air exhausted from the enclosure to create a negative pressure within the enclosure shall be filtered to remove all hazardous and other particulate matter, in

5. full compliance with all regulatory requirements of all governmental agencies. All rigid elements of the enclosure shall be designed to sustain the maximum anticipated wind forces per Chicago Building Code Section 13-52, latest edition, for the period during which they will be maintained.
6. The Contractor shall be responsible for maintenance of the physical and structural integrity of the blast enclosure at all times of operation and during off hours. Any cracks or holes that may occur during the course of the work shall be repaired immediately. Improper construction or maintenance of the containment enclosure resulting in visible clouds of dust outside the containment, or particulate in the air above EPA allowable limits, will be considered unacceptable. The Contractor shall immediately remove or clean any dust or residue which is found outside of the containment.
7. The Contractor shall appoint personnel to inspect and maintain the enclosure at all times of the operation.
8. The Authority will have the right to stop the progress of work if the Contractor fails to maintain a sound enclosure or is found in violation of any safety rules, including safety rules of the Authority or of the site specific health and safety plan. No time extensions will be given for any lost time.

B. Disposal:

1. Waste materials shall be contained in receptacles approved by U.S. Department of Transportation (49 CFT) for the classification of waste involved. All containers of waste shall remain covered at all times except when adding waste.
2. All blasting residues shall be collected daily and deposited in all-weather containers supplied by the Contractor as temporary storage. Blast residues shall be collected and transferred carefully and shall not result in suspension of residues in air or contamination of surrounding surfaces. No residues shall remain on surfaces overnight. The all-weather containers shall meet the requirements for the transportation of hazardous materials. At a minimum the containers shall be equipped with liners and have a tarpaulin cover. All containers shall be approved by the Authority prior to use on the site.
3. Comply with all methods and procedures required by governing agencies for the temporary storage, transport and disposal of all waste.
4. Provide the Authority with the Generator's copy of the manifests for disposal of all waste removed from the site. All waste transportation shall be provided by a licensed special waste hauler. When completing the Uniform Hazardous Waste Manifest for special/hazardous waste, Boxes 1,3 and B should be completed as follows: (1) ILD 005532205; (3) Chicago Transit Authority, 567 W. Lake Street, Chicago, IL 60661; (B) 0316005915.
5. The containers used for temporary storage and transport of the special waste, including hazardous waste, shall be managed in accordance with 40 CFR Part 265 Subpart I entitled "Use and Management of Containers". The containers shall be inspected on a daily basis.
6. Hazardous abrasive blast/paint debris: The Contractor shall conduct TCLP analysis for lead, arsenic cadmium and chromium to determine if waste generated is hazardous. Waste shall be stored off-site prior to land disposal in accordance with the treatment standards set forth in 40 CFR 26D.
7. Non-hazardous abrasive blast/paint debris: The Contractor shall test existing coatings, by methods approved by the Authority, to verify that they do not contain lead. For these areas, the Contractor shall propose an alternate method for disposal to be approved by the Authority and its designee.
8. The Contractor shall make arrangements to have other special waste, such as used paint solvent, paint cans and liners, and contaminated personal protective equipment (PPE) which it generates, transported to the Contractor's facility at the end of each day of which the waste is generated. The Contractor shall not combine solvents, PPE or any other hazardous or non-hazardous waste with the

- blast residue waste. All waste streams must be tested prior to transporting to avoid illegal transportation and storage of hazardous waste materials.
9. The containers used for temporary storage and transport of the waste shall be placed within the enclosure or within a maximum distance of no more than 10 feet from the enclosure area in which work is being performed.
  10. The Contractor shall collect and filter all contaminated water for power washing, steam cleaning, hygiene purposes, laundering of clothing if done on site, and cleanup activities. Filter visible paint chips and particulate from the water prior to placing it into the containers. Test the water for total toxic metals and provide ample filtration until the water is not classified as hazardous. Conduct the necessary laboratory testing as described above.
  11. Make disposal arrangements with an Authority approved disposal facility.

C. Protective Equipment:

1. The Contractor shall provide and require all employees to wear all personal protective equipment required in 29 CFR 1926.
2. Adequate personal protective equipment shall be provided and maintained on the job at each specified work location for use by up to three qualified Authority employees and each inspector from the Authority assigned to the project. This equipment shall be suitable to allow the Authority's personnel access to any area in which work is being performed.

3.06 COATINGS ON CLEANED METAL SURFACES

A. General

1. The coatings shall be applied only when weather conditions and steel surface conditions comply with the coating manufacturer's recommendations or as modified herein. The Contractor shall take whatever steps are necessary to maintain controlled environment in order to ensure that pre-application, application and post-application conditions are in accordance with these documents and the coating manufacturer's recommendations.
2. Coatings shall be applied at the recommended spreading rates, but thicknesses shall not be less than the minimum dry film thickness specified. Should the spreading rate fail to produce full coverage of the required thickness in one coat, additional coating shall be applied until the minimum requirements are met.
3. Coatings shall be applied in strict compliance with the manufacturer's recommendations or as modified herein, including storage, mixing, handling, environmental conditions, surface temperature and additives for accelerated drying if necessary. All coating materials shall be delivered to the applicator in the manufacturer's original containers, unopened and with the label bearing the manufacturer's name, product identification and application instructions.
4. No coating work shall be conducted when the steel substrate surface temperature is less than five (5) degrees F above the dew point; or below or above the manufacturer's recommended steel surface temperature; or the surrounding air temperature is below 50 degrees F or expected to drop to 40 degrees F or below before the coating has cured or the relative humidity is over 85%; unless approved otherwise in writing by the manufacturer. The use of a special part B for the epoxy may be required.
5. Ties are to remain in place. Apply coating to 100% of the top surfaces of track stringers and bracing between the ties, and to 100% of the surfaces of the cross girders.
6. Contractor shall contain over-spray during coating spray operations. Contractor shall not build-up coating in vicinity of wood ties or power distribution cables.

B. In preparation of previously painted surfaces when it is approved by the Authority not to

remove all existing coating or the existing coatings are determined to not contain lead; it is necessary to remove all corrosion and all coating which shows evidence of corrosion, peeling, excessive thickness, brittleness, blistering, scaling or general disintegration. It is essential that the removal of the old coating be carried back around the edges of the spot or area until an area of completely intact and adhering coating film, with no rust or blisters underneath, is attained. Edges of tightly adherent coating remaining around the area to be recoated shall be feathered so that the repainted surface can have a smooth appearance. The remaining old coating should have sufficient adhesion so that it cannot be lifted as a layer either by inserting a blade of dull putty knife under it or cracked off by impact of a hand chipping hammer. Priming, protective coating, and top coating are required for surfaces where the old coating and primer has been fully removed. For surfaces where the old primer is in sound adhesion to the substrate, protective coating and a top coating are only required.

C. Inspection: All surfaces to be coated shall be thoroughly cleaned to the satisfaction of the Authority and shall be inspected in accordance with the inspection requirements outlined in the Contractor's Quality Program as specified in guidelines for contractor's quality program of this contract and accepted by the Authority before any coating is applied.

D. Epoxy-Mastic Protective Coat

1. Deeply pitted areas shall receive one (1) brush-applied spot coat of protective coating material, 5 mils dry film thickness.
2. All cleaned areas of the entire metal structure, plus three (3) inches of adjacent concrete surfaces and the deeply pitted spot-prime areas, shall receive one (1) coat of protective primer material between seven (7) mils minimum and eleven (11) mils maximum dry film thickness, above the metal substrate.

E. Top Coat

1. The entire structure shall receive a minimum of one (1) spray coat or two (2) rolled coats of Aliphatic Acrylic Urethane top coat material, between three (3) mils minimum and five (5) mils maximum dry film thickness. When applying recoats, all additional coats are to be within manufacturer's recoat window.
2. Top coating should be applied as soon as recommended by the manufacturer, as specified in the Contract Documents, and/or as approved by the Authority.
3. All material shall be applied within recoat windows per manufacturer's requirements.

F. Clean-Up

1. Oily or paint-filled rags or waste and other combustible materials shall be the responsibility of the Contractor. The Contractor shall dispose of these materials in metal containers with tight fitting lids on a daily basis. The proper disposal of these materials is the responsibility of the Contractor.
2. Prior to final completion and acceptance, the Contractor shall examine all painted and finished surfaces and retouch or refinish as necessary to leave all surfaces in acceptable condition to the Authority.
3. Upon completion of the work, the Contractor shall remove all coating and varnish spots from floors, glass and other surfaces and remove all rubbish and other accumulated materials of this nature from the premises and dispose of same legally. Work areas shall be left in a clean and orderly condition acceptable to the Authority.
4. The areas where surface preparation work is being performed shall be cleaned of all residue and be in broom clean condition upon completion of each day's work.

END OF SECTION

SECTION 31 09 13  
GEOTECHNICAL AND STRUCTURAL INSTRUMENTATION AND MONITORING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Purpose: Generate reliable data to be used to foresee problems of structure, utility, equipment, and ground movement that include but not limit to verifying that the:
  - 1. Installation of the excavation support system results in adjacent ground movements that are within acceptable limits so that damage to adjacent infrastructure is minimized.
  - 2. Installation of the track structure shoring system results in track structure movements that are within acceptable limits so that damage to track, supporting structures, and interruptions to train operation is avoided.
  - 3. Track and ground movements adjacent to open cut of embankment are within acceptable limits so that damage to tracks is avoided.
- B. Scope: The work includes, but is not limited to, furnishing, installing, calibrating all necessary equipment, developing monitoring software, establishing survey points, and all necessary equipment and materials for a complete monitoring system.
- C. Monitoring system includes, but not limited to the following: Install slope inclinometers to measure lateral deformations adjacent to temporary support walls. Measure movements at selected locations on the ground surface, on top of railroad ties, on track shoring structures, on top of temporary support walls and on the exterior and interior of adjacent buildings using surface monuments, tilt meters, string potentiometers, and other devices. Measure pore water pressures within soft clays adjacent to excavations.
- D. Vibration monitoring for adjacent infrastructure: Ensure that the monitoring requirements for this specification and Specification 02 22 13 Vibration Monitoring Protocol are coordinated.
- E. Division of Responsibility: The Contractor's field instrumentation specialist is responsible for providing, installing and obtaining data from the ground instrumentation and from the structural instrumentation. The Contractor is responsible for providing and maintaining access to instrument locations throughout construction. The Contractor reviews reported data against requirements in the Contract Document.
- F. Adjacent Properties: The Contractor is to meet the requirements for the protection of adjacent properties from the construction of temporary shoring, earth retention systems and open cuts as directed by the Engineer.
- G. Related work specified elsewhere:
  - 1. Section 02 22 13, Vibration Monitoring Protocol
  - 2. Section 31 15 00, Structure Shoring
  - 3. Section 31 20 00, Earthwork
  - 4. Section 31 50 00, Excavation Support and Protection



### 1.03 REFERENCES

- A. Chicago Transit Authority Adjacent Construction Manual (CTA ACM), applicable Sections as specified in this Specification.

### 1.04 SUBMITTALS

- A. Resume of the field instrumentation specialist, and other key personnel, detailing relevant experience and qualification as specified in Part 1 – Quality Assurance.
- B. Product data for all monitoring equipment used including measurement range, resolution, repeatability, accuracy and precision, temperature range, etc, as applicable for individual equipment.
- C. Drawings and details showing proposed physical locations of instrumentation indicating layout and instrumentation installation details. The plan must show the instrumentation in relation to nearby:
  - 1. Existing track structures and supporting foundations with bent identification numbers.
  - 2. Shoring structures to be installed.
  - 3. Any installations for protecting shoring structures.
  - 4. Surface and subsurface infrastructure.
  - 5. Proposed limits of excavation support walls.
  - 6. Proposed limits of sloped open cut excavation.
  - 7. Limits of adjacent private properties.
- D. A process plan that contains a detailed step-by-step procedure for conducting and reporting all monitoring measurements to include, but not limited to, the following:
  - 1. A schedule indicating the proposed time sequence of instrument installation.
  - 2. Field validation plan and summary report of the results as specified in Part 3 – Installation of Instruments.
  - 3. A schedule complying with required monitoring and reporting frequencies, for all instruments and monitoring points..
  - 4. Types of monitoring instruments with manufacturer's data sheets including regularly scheduled calibration and maintenance procedure requirements.
  - 5. Data survey methods for optical surveys necessary to demonstrate that the specified accuracies can be achieved at a minimum 95 percent level of confidence.
  - 6. Definition of Warning and Limiting Values for each proposed instrument/survey location, conforming to requirements herein.
  - 7. Data processing procedures.
  - 8. Reporting procedures for reports and for when limiting and warning values are exceeded.
  - 9. Outlines of sample reports and processed data forms.
- E. Processed data as specified in Part 3 – Data Collection and Processing.
- F. Contingency Plans: Submit contingency plans to stabilize soil and/or structures affected by adverse movements detected by the instrumentation when Warning/Limiting Values are reached. Submit contingency plans at least two (2) months prior to start of excavation work and/or track shoring structure installation. An agreement is to be reached between the Engineer and the Contractor on the contingency plan to be utilized for stopping further movement, prevention of additional damage, and corrective actions. Contingency Plans include the following information:
  - 1. Name(s), telephone number(s), and location(s) of person(s) responsible for implementation of

contingency plans.

2. Materials, equipment and supplies required to implement contingency plans.
3. Location at work site of all necessary materials, equipment and supplies required to implement the contingency plans.
4. Each type of anticipated remedial method proposed to stabilize soil and/or structure movements. Include basis for determining proposed actions.
5. Step-by-step procedure for performing work involved with contingency plans.
6. Clear identification of objectives of contingency plans and methods to measure success of contingency plans.

G. Qualifications for the monitoring equipment that meet the requirements as specified in Part 2 – Products.

#### 1.05 QUALITY ASSURANCE

- A. The Contractor employs the services of a field instrumentation specialist experienced in ground and structure monitoring similar to that which is expected for this project. The field instrumentation specialist must be a registered Professional Engineer, Structural Engineer or Engineering Geologist in the State of Illinois and have demonstrated previous successful experience on a minimum of two (2) projects for the installation and monitoring of the types of instrumentation necessary to successfully monitor the ground and structures for this project. The field instrumentation specialist must have supervised instrumentation programs similar in magnitude and similar in subsurface conditions on at least one (1) project.
- B. Prior to the start of construction, the field instrumentation specialist meets with the Contractor so that all parties understand the nature and extent of the instrumentation program. The Contractor provides access to instrument locations and prevents construction activities that would damage ground instruments during construction.
- C. Employ the services of an Illinois Licensed Surveyor to provide required monitoring and data.

### PART 2 – PRODUCTS

#### 2.01 EQUIPMENT

- A. Materials are to be new and have a design life of at least five (5) years. Unless specified otherwise, all items such as housings, anchor bolts, brackets, etc. are applied as recommended by the instrument manufacturer.
- B. The monitoring instrumentation system is to achieve the accuracy, resolution, and tolerance as specified in Part 3 Warning Value and Limiting Value as well as the work to be monitored. The individual equipment is to be selected by the field instrumentation specialist and the system performance is to be field validated per Part 3.

### PART 3 - EXCUTION

#### 3.01 INSTALLATION OF INSTRUMENTS

- A. The Contractor's field instrumentation specialist is to install, or supervise installation of, the field instrumentation. Field instrumentation installation will follow the manufacturer's instructions.
- B. The location of the instruments will be per approved submittal.
- C. Installation of any instrument will not damage or interfere with existing utilities and shoring structures. Where displacement monitoring points are installed on surfaces that may be snow plowed the Contractor will derive all appropriate means to protect the displacement monitoring points from damage.

### 3.02 DATA COLLECTION AND PROCESSING

- A. Validation of equipment and crew: The installed monitoring system, each component thereof, as well as the personnel operating each piece of equipment is to be field certified for the accuracy and reliability required for the Warning and Limiting Values. The field instrumentation specialist is responsible for creating the validation plan and certifying that the equipment and personnel have successfully completed the plan.
- B. The field instrumentation specialist is to collect and process data from all field instrumentation and monitoring points. The processed survey data will be submitted on a similar form as shown in Appendix E in CTA ACM.
- C. The field instrumentation specialist is to perform readings at frequencies required, giving consideration to the construction procedures, site conditions type of proposed instrumentation, etc.:
  - 1. For excavation within the Zone of Influence as specified in Section 3 of CTA ACM, monitoring frequency specified in CTA ACM Section 10.3 will be followed.
  - 2. For shoring structures directly supporting the CTA elevated track structures, follow the monitoring frequency specified in CTA ACM Section 10.3 along with the following minimum requirements:
    - a. Requirement (b) is revised into: Take one reading before the load is transferred to the shoring structure and one reading after. Take one reading prior to putting track into service. Then, take readings with (8) hours interval for (2) days.
    - b. Schedule sufficient time to jack the track structure back to the original elevation before putting track into service if warranted.
    - c. Supplemental Monitoring as specified in CTA ACM Section 10.4 is not required.
- D. Lateral and vertical displacement reference points consist of clear and observable points on running rails, track structure, structure shoring, earth retention structures and open cuts, as applicable. Clean surfaces by wire brush to permit easy identification of the exact point.
- E. For earth retention structure or drilled shaft adjacent to CTA tracks, the survey points comply with Figure 10-1 in CTA ACM, unless otherwise directed by the field instrumentation specialist that more survey points are required. For shoring structure directly supporting elevated track structures, survey points must be on the shoring structure and the elevated track structure component that the shoring structure is supporting.
- F. Instrumentation measurements will indicate if unacceptable reading levels are imminent or have already been reached. These levels, which comprise Warning and Limiting Values, are defined collectively as Response Values. The actions associated with these levels are defined below. The actual actions to be implemented are referred to herein as response actions. Warning and Limiting Values, except for CTA Track Structure, are subject to adjustment as indicated by prevailing conditions or circumstances.
- G. The Contractor's field instrumentation specialist must be responsible for defining and submitting the Warning and Limiting Values for approval based on the type of work and the nature of the structure; except for those Values which are as defined herein:
  - 1. Limiting and Warning Values as specified in Section 10.2 of CTA ACM for CTA tracks.
  - 2. Limiting Values as specified in Section 7.9 of CTA ACM for top of shoring wall within the Zone of Influence of CTA tracks.
  - 3. Temporary shoring within the zone of influence for highway or street is coordinated with governing agency.
  - 4. The Contractor is responsible for adhering to the Warning and/or Limiting Values as defined by governing agency or Authority, property owner or utility owner having jurisdiction.
  - 5. Warning Values are determined by the Contractor's field instrumentation specialist based on the Limiting Values specified.
- H. If a Warning Value is reached:

1. Notify Engineer, governing agency, or owner within 12 hours. .
  2. Perform Supplemental Monitoring to measure rail movements and cross-slope under dynamic loading using pumping gage as specified in Section 10.4 of CTA ACM.
  3. Within 24 hours of monitoring data indicating that a Warning Value has been reached, implement contingency plans per approved submittal.
- I. Take all necessary steps such that the Limiting Value is not reached. The Engineer may require the Contractor to suspend activities in the affected area.
- J. If a Limiting Value is reached:
1. Notify Engineer immediately. CTA reserves the right to suspend all construction activities in the affected area with.
  2. Within 24 hours of processing instrumentation data indicating that a Limiting Value has been reached, implement contingency measures as specified in approved process plans for stopping further movement and corrective actions.
  3. Perform a detailed evaluation of construction procedures and submit to the Engineer the evaluation and recommended procedures to reduce movement. Furnish and install additional instruments if they are needed to further define the magnitude of the indicated problem. Obtain approval of the Engineer prior to restarting construction work in affected area.

### 3.03 AVAILABILITY OF DATA

- A. Formal monitoring reports, per approved formatting, are submitted within 5 working days of retrieving the raw data. Raw data is made available to the CTA within one working day of reading when requested. The Contractor may observe the readings at any time, or take supplementary readings. The Contractor is responsible for the safety and serviceability of the work. The Contractor is to make interpretations of the data for the purposes of monitoring for any movement. Do not disclose instrumentation data to third parties. Do not publish data without prior written approval of the CTA.

### 3.04 DAMAGE TO INSTRUMENTS

- A. Take precautions during the course of construction to prevent damage to instruments and monuments. . The Contractor shall pay all costs associated with restoring damaged instruments.

### 3.05 DISPOSITION OF INSTRUMENTS

- A. Remove all structural instrumentation by the Contractor's field instrumentation specialist at the conclusion of the monitoring effort. Ground instrumentation is disposable and will remain in place. Cavities for in-ground instrumentation are to be filled with an approved material.

END OF SECTION

SECTION 31 15 00  
STRUCTURAL SHORING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification sections, apply to this section.

1.02 SUMMARY

- A. General: This section specifies requirements for temporary shoring (earth retention system excluded) of buildings and facility structures, existing and/or proposed bridge and rapid transit structures, and any other construction and structure during demolition and construction operations, which require temporary support for stability and/or serviceability. The work under this section must include all labor, material, tools, and equipment required to design, provide, install, maintain, monitor, and remove temporary support in a safe and controlled manner to facilitate removal, relocation, repair, additional new structure and related work as shown on the drawings, specified herein and directly by the Authority.
- B. Review these documents for coordination with additional requirements and information that apply to work under this section.
- C. Related Sections:
  - 1. Section 02 41 16 - Structural Demolition
  - 2. Section 02 41 19 – Selective Structure Demolition
  - 3. Section 03 20 10 – Concrete Reinforcement Epoxy Coated
    - a. Concrete reinforcement for structural shoring needs not be epoxy coated, unless the structure shoring is anticipated to be in service carrying vehicle or track loading for more than a one-year period for bridge or track structures.
  - 4. Section 03 30 00 – Cast-In-Place Concrete
  - 5. Section 05 10 30 – Structural Steel
  - 6. Section 31 09 13 – Geotechnical and Structural Monitoring Instrumentation
  - 7. Section 31 20 00 – Earthwork
  - 8. Section 31 50 00 – Excavation Support and Protection

1.03 REFERENCES

- A. General:
  - 1. CTA Infrastructure Design Criteria Manual (IDCM) Chapter 7, Structural. Unless otherwise noted, all references included in this Section must be current one published at the time of contract solicitation.
  - 2. In addition to the references specified herein, all material specific design references specified in the Drawings must be used for the shoring structure design.
  - 3. Material used for the shoring structures must comply with these Specifications as referenced in 1.02 C, Related Sections.
- B. Building and Facility Structures:

1. American Society of Civil Engineers (ASCE 37) "Design Loads on Structures During Construction".
  2. American Institute of Steel Construction (AISC) Design Guide 10 Erection of Low-Rise Structural Steel Buildings, Section 3.3
- C. Bridge Structures:
1. AASHTO Guide Design Specification for Bridge Temporary Work
- D. Track Structures:
1. American Railway Engineering and Maintenance of Way Association (AREMA) "Manual for Railway Engineering".

#### 1.04 DEFINITIONS

- A. The Contractor's Engineer is defined as be a licensed Structural Engineer in the State of Illinois and experienced in the design of the type of shoring to be designed.
- B. When the term "Design" is used in this Specification section, it must be understood as the Contractor's Design.
- C. When the term "sealed" is used in this Specification section, it must be understood as sealed structural calculations, drawings, or letters by the Contractor's Engineer.

#### 1.05 SHORING DESIGN REQUIREMENTS

- A. General:
1. Design drawings and calculation must be prepared by the Contractor's Engineer based on the requirements listed in this Section.
  2. The Design and details must be prepared in accordance to the Contractor's staging for construction, as detailed in the contract documents. Staging must incorporate any Designer of Record (DoR) requirements listed in the "Suggested Staging/Shoring" drawings of the contract documents.
  3. The Design must ensure the stability and integrity of the structure during construction and/or demolition and removal.
  4. The shoring system shall be able to maintain lateral stability under any jacking operation.
  5. The Design must not damage or otherwise lessen the quality or life of any portion of the structure that is to remain.
  6. The Design must consider potential risks to the proposed shoring system including, but not limit to, underground utilities, adjacent structures, traffic, construction equipment impacts etc.
  7. Contractor's Engineer must determine the adequacy of existing structure at time of shoring installation to resist the concentrated force imposed through jacking device. Design must include details to distribute concentrated forces.
- B. Building and Facility Structures
1. For temporary shoring used during construction or repair of building and facility structures that are not open to public. Design loads must comply with American Society of Civil Engineers (ASCE 37) "Design Loads on Structures During Construction", with the following modifications and clarifications:
    - a. Section 1.2, the use of Ultimate Strength Design (USD) is not allowed.

- b. Section 1.4, the use of other authoritative documents is not allowed, unless otherwise approved by the Authority.
  - c. Section 2.4 does not apply. Sections 1.03 C and D of this specification apply to bridge and track structures.
  - d. Table 4-4, very light duty and light duty working load are not permitted to use. The minimum working load must be 30 psf, unless medium duty or heavy duty are required based on the specific construction.
  - e. Chapter 5 – Lateral Earth Pressure does not apply to this Specification.
  - f. Section 6.2, the minimum wind pressure of 20 psf must apply.
  - g. Section 6.5 does not apply to this Specification.
  - h. When loads are determined with ASCE 37, material capacity overstress is not allowed.
  - i. For temporary shoring required for steel building and facility structures erection, an additional stability load must be included per AISC Design Guide 10 Section 3.3.
2. For temporary shoring used during construction or repair of building and facility structures that are open to public, design methodologies and design loads in the Contract Documents must be used for the shoring structure design. Connection between the permanent structures and temporary shoring structures must have positive connection with mechanical fasteners.
- C. Bridge Structures:
- 1. For temporary shoring used during construction or repair of bridge structures when bridge is not open to public vehicle traffic, or partially closed and the temporary shoring structure is not used to public support vehicle traffic. Design Loads must comply with AASHTO Guide Design Specification for Bridge Temporary Work Section 1 and 2, with the following modifications and clarifications:
    - a. Section 2.0, the drawings and calculations must be stamped and signed by the Contractor's Engineer.
    - b. Section 2.1.2.2 Salvaged Steel ASTM A6 is not allowed. At a minimum, ASTM A36 must be provided for temporary shoring structures.
    - c. Section 2.2.3, Construction live load must be a minimum of 30 psf in addition to the equipment weight and the 75 plf line load.
    - d. Section 2.2.5.1, the entire section can be eliminated and replaced with "the minimum wind pressure on shoring system is 20 psf".
  - 2. For temporary shoring used during construction or repair of bridge structures when bridge is open to vehicle traffic and the temporary shoring structure is used to support vehicle traffic. design methodologies and design loads shown in the Contract Documents must be used for the shoring structure design.
- D. Track Structures:
- 1. For temporary shoring used during construction or repair of track structures when track structures are not open to rapid transit traffic, or partially closed and the temporary shoring structure is not used to support rapid transit traffic. Shoring design must comply with AREMA Manual for Railway Engineer Chapter 8 Part 28 Section 28.6, with the following modifications and clarifications:
    - a. Article 28.6.2 c, Construction live load must be a minimum of 30 psf in addition to the equipment weight and the 75 plf line load.
  - 2. For temporary shoring used during construction or repair of track structures when track structures are open to rapid transit traffic, and the temporary shoring structure is used to carry rapid transit traffic. Shoring structures must be designed per AREMA Manual for

Railway Engineer Chapter 8 and Chapter 15 as permanent structures.

- a. Design speed of trains must be full speed, unless otherwise allowed in writing by the Authority.
- b. Steel elements in the temporary shoring structures anticipated to be in service for less than a one year period do not need to consider fatigue. However, fatigue detail categories E', E, or D must not be used.
- c. Connection between the permanent structures and temporary shoring structures must have positive connection with mechanical fasteners. Use of frictional forces to transmit forces from steel shoring system to ground bearing pads is not permitted.

E. Additional Requirements for Track and Track Structure Profile Adjustments:

1. Where existing track and structure profile is to be adjusted as part of the construction, the shoring Design and staging plans must be developed to adhere to project specific jacking limits as noted in the Contract Documents. Shoring system must allow for elevation adjustments between short train intervals to change and/or maintain track profile as required per the Contract Documents.
2. Final profile adjustments must be based on information from the Contractor's survey and done as per the 31 09 13 Monitoring Specification.
3. 1/4 inch jacking limit is permitted without special modifications to connections of the existing or new structure, relative to:
  - a. Parallel to tracks, from bent to bent
  - b. Perpendicular to tracks from stringer to stringer (left running rail to right running rail)
4. Relative jacking limit greater than 1/4 inch: Contractor's Engineer must submit engineered plan demonstrating affected connections have sufficient rotational capacity to resist relative jacking amounts in excess of 1/4 inch.
5. Contractor must review existing track conditions to determine existence of any shims and incorporate into jacking plan.
6. Contractor's Engineer must determine the adequacy of existing structure at time of shoring installation to resist the concentrated forces imposed through jacking device. Design shall include details to distribute concentrated forces.

F. Shoring Design Calculations:

1. Design calculations shall be provided for all elements and their connections of the shoring system.
2. All controlling dimensions shall be field verified prior to fabrication.
3. The design calculations shall demonstrate that a clear, straightforward load path exists.

G. Shoring Design Drawings:

1. The suggested shoring scheme shown on the Contract Drawings are conceptual and provide criteria and/or requirements. The Contractor's Engineer must prepare all shoring design drawings. The drawings must incorporate the Contractor's phasing/staging and procedure for execution of shoring. Diagrams from product data are not an acceptable alternative to engineered drawings. At a minimum, the shoring design drawings are to include the following:
  - a. Provide a layout showing locations for all shoring as required by the demolition and new construction work for the project.
  - b. Provide a layout for all phases.



- c. All layout drawings to include locations of underground utilities. Concurrence on design must be received from agencies representing underground utilities prior to final design.
- d. All layout drawings to include locations of excavations. Concurrence on design must be received from the Contractor's Engineer in responsible charge for stability of the excavation, prior to final design.
- e. Indicate all field-verified dimensions and conditions that affect the shoring operations.
- f. The Design must show plans, elevations, and details, including connections, with adequate clarity to demonstrate how the design will adequately resist and transfer all loads into the ground.
- g. All points of jacking must be detailed.
- h. Detailed plan on how the structure is jacked and how the jacks are not used to support live load of trains.

H. Monitoring:

- 1. The Contractor must a monitoring plan for shoring per the requirements of Section 31 09 13 Geotechnical and Structural Monitoring Instrumentation for requirements.

1.06 SUBMITTALS

- A. Submit the following under provisions of Division 01 Section, Submittal Requirements:
- B. Contractor's structural staging/phasing/demolition drawing plans, sealed structural shoring Design drawings and calculations. Drawings and calculations are to be submitted for review at 30%, 60% and 100%, following the guidance in the Authority's Infrastructure Design Criteria Manual (IDCM) Chapter 7, for review. Connection design is not to be delegated to the fabrication shop.
- C. Shop drawings must be based on and consistent with Design. Fabrication must not commence until final acceptance is obtained. The Authority's acceptance of the shop drawings must in no way relieve the Contractor of responsibility for constructability, fabrication and fit-up in the field.
- D. Submit site specific Process Plan that contains:
  - 1. Detailed construction sequences showing all steps in the shoring erection and removal.
  - 2. Detailed sequences showing all steps in engaging and disengaging the shoring structures.
  - 3. Provide hold points for construction verification, as per 1.07A and 3.01 B.
  - 4. All other requirements per General Division 1 of the Specifications.
- E. Product data sheets for jacking devices.
- F. Product data for any proprietary devices used proposed as part of shoring.

- G. Letter from Contractor's Engineer. as per 1.07 A and 3.01 B.

## 1.07 QUALITY ASSURANCE

- A. The Contractor's Engineer must review all shop drawings and verify all dimensions and procedures. Partial submittals will be returned without review.
- B. Confirmed or surveyed field dimensions must be included in drawings prior to fabrication.
- C. For shoring structures specified in Section 1.04 D 2, the Contractor's Engineer must be experienced in the design of similar shoring for CTA Track Structure Shoring.

## 1.08 INSPECTION

- A. Contractor's Engineer responsible for design of shoring must review field installations prior to transfer to transfer of load. Written confirmation that the shoring was installed per the design must be submitted to Authority for record. The Authority reserves the right to provide additional comments that must be addressed prior to load transfer.
- B. Prior to disengaging the shoring structure, it is the Contractor's responsibility to provide inspection and testing reports for all permanent structures per the specific material Specifications and ensure the permanent structure is complete in either the final condition or intermediate stage condition. The contractor is also to notify CTA at least one week prior to disengaging the shoring to allow for CTA or its designee to review the permanent structure and verify that it is in compliance with the design documents, if CTA so chooses.

## PART 2 PRODUCTS

### 2.01 GENERAL

- A. All materials and fabricated items must be furnished by an established and reputable manufacturer or supplier.
- B. Refer to CTA IDCM Chapter 7 for acceptable materials, their sizes, and strength.
- C. Hydraulic jacks, if used, must be equipped with check valves and shut-off valves to isolate individual rams. The system must be equipped with hydraulic pressure gauges to monitor line pressures. The system must also be equipped with a locking mechanism. The rated capacity of a jack must be a minimum of 50% greater than the calculated jacking force.

## PART 3 EXCUATION

### 3.01 PREPARATION

- A. Prior to fabrication, the Contractor's Engineer who designed the shoring system must review and approve all shop drawings for the shoring structure, with concurrence from the Authority.
- B. Contractor's Engineer must review the field installation of the Design prior to load transfer at each stage/phase of the Contractor's plan. The Contractor's Engineer must write a sealed letter for submittal to Authority certifying that the shoring installation was erected in accordance with the Design Drawings and meets its approval. This letter must be received for record by the Authority prior to transferring load to shoring.
- C. The Contractor must establish and locate all lines and levels and be responsible for correct locations of all shoring.

- D. The Contractor must verify the location of utilities or structures affected by shoring. Any disturbance or damage to existing structures or other property, caused by the Contractor's operations must be repaired by the Contractor in a manner satisfactory to the property Owner, at no additional cost to the Chicago Transit Authority.
- E. The Contractor must verify the support base of sufficient soil capacity for the proposed shoring.
- F. Connections to existing rapid transit traffic supporting columns, stringers, and cross girders must be mechanically fastened with high strength F3125 structural bolts and must incorporate existing rivet holes if possible. The recommended rivet removal procedure to be followed is provided in Specification 02 41 19 – Selective Structure Demolition. Alternate methods may be submitted for review.

### 3.02 STEEL FABRICATION

- A. Structural steel used to carry rapid transit traffic or vehicle traffic must be fabricated in accordance with Sections 505, 506, and 1006 Steel Structures, of the IDOT Standard Specification including the current Supplemental Specifications for these Sections and applicable IDOT Guide Bridge Special Provisions. For structural steel used to carry rapid transit traffic, fabrication must also be in accordance with Part 3, Fabrication, Chapter 15 of the AREMA Manual. Where differences occur in the provisions of the IDOT Standard Specification and the AREMA Manual, the more stringent requirement must be followed, as determined by the Authority.

### 3.03 ASSEMBLY AND ERECTION

- A. Structural steel used to carry rapid transit traffic or vehicle traffic must be assembled and erected in accordance with Sections, 506, and 1006 Steel Structures, of the IDOT Standard Specification including the current Supplemental Specifications for these Sections and applicable ID OT Guide Bridge Special Provisions. For structural steel used to carry rapid transit traffic, assembly and erection must also be in accordance with Part 4, Erection, Chapter 15 of the AREMA Manual. Where differences occur in the provisions of the IDOT Standard Specification and the AREMA Manual, the more stringent requirement must be followed, as determined by the Authority. Field welds other than those shown on the drawings are prohibited unless specifically authorized by the Authority.
- B. Piles and sheet piles must be installed with vibratory hammers.
- C. The sequence of work must follow that outlined in the Drawings. Any deviations must be made only with the prior approval of the Authority.

### 3.04 HYDRUALIC JACKS

- A. Live loads of rapid transit traffic, vehicle traffic, or similar equipment must not be supported hydraulically.
- B. When changing structure profile less than or equal to ¼", live loads may be allowed to pass over the structure while it is supported by the hydraulic jacking system only when the jacking system is mechanically blocked with the locking mechanism.
- C. When changing structure profile more than ¼", jacking under live track will not be permitted. This work will be permitted with a track closure and flagger protection if the

contractor's site specific process plan for the proposed work is acceptable to the Authority.

### 3.05 PROTECTION

- A. The Contractor must be responsible for protecting and maintaining any existing shoring of the elevated structure and platform which is affected by his shoring operations and to prevent his own shoring from disturbance by traffic and construction. When shoring structures are located on the roadway or in an active construction area with heavy equipment and may be subjected to vehicle collision, shoring structures must be designed to withstand vehicle collision force specified in CTA IDCM Chapter 7 Section 7.3.15, or IDOT standard F shape barriers can be installed to redirect errant vehicles.

END OF SECTION



## **CTA REQUIREMENTS FOR CONTRACTORS WORKING ALONG THE RIGHT-OF-WAY (R.O.W.)**

### **General Comments:**

Contractor performing construction work adjacent to the CTA Right-of-Way (R.O.W.) can present hazards to CTA's property. The contractor shall have CTA flagmen present to assist them on the R.O.W. The CTA may also require inspectors and infrastructure trades (Linemen, Signal Maintainers, etc.). The cost of these services is the responsibility of the contractor and the must be prepaid.

Prior to the start of any work in close proximity of the CTA's R.O.W. the contractor shall meet with a CTA representative to determine the requirements for the flagmen and other trades, if required and other necessary items related to the work activities next to the CTA facilities and to receive CTA's approval for the contractor's proposed operations.

All Contractor and Subcontractor employees assigned to work on, over or near the CTA R.O.W. shall be required to attend an all-day Rail Right-of-Way Safety Training Session. The cost of this training is currently \$200 per employee, paid by the Contractor in advance.

The contractor shall notify the CTA representative at least 30 days prior to the performance of any work. The CTA's representative for all outside construction work will be:

**Abdin Carrillo**  
**Project Manager, Construction Oversight**  
**567 West Lake Street, 9<sup>th</sup> floor**  
**Chicago, IL. 60661-1465 (312)**  
**681-3913**  
[ADJConstruction@transitchicago.com](mailto:ADJConstruction@transitchicago.com)  
Cc: [acarrillo@transitchicago.com](mailto:acarrillo@transitchicago.com)

The Chicago Transit Authority reserves the right to restrict or prohibit work in or adjacent to the R.O.W. in an emergency and to the extent the Chicago Transit Authority determines that such work has adverse impacts on CTA Transit Operations. NO work may be performed during "Rush Hour" periods (Monday through Friday, from 0500 to 0900 and from 1500 to 1900 hours).

Workers from adjacent construction projects are prohibited to enter the CTA's R.O.W, unless CTA permission has been granted and workers have completed the Rail Right-of-Way Safety Training Session (no workers are allowed on the CTA R.O.W. without the presence of CTA Flaggers). Use of cranes or other equipment directly above the CTA's R.O.W. is also prohibited.

Contractors performing work within 50 feet of the CTA R.O.W. and/or property are required to obtain Railroad Protective Insurance coverage.

When installing deep foundations (or jacking under the CTA R.O.W.) the contractor shall continuously monitor the existing CTA's at-grade track and elevated structure footing for movement or other signs of distress. Appropriate remedial measures must be approved by CTA.

Once the excavation for any caissons that progress deeper than 8 feet, or to the water table, whichever is smallest, the work on that caisson shall be carried on continuously, 24 hours a day, including Saturday's, Sunday's, and holiday's until the caisson has been completed.

If at any time, work on any caisson is not continuous, for any reason, and not approved by the CTA, all caissons, which have been installed, shall be filled with sand or slurry at the contractor's expense.

Should any of the proposed work require the contractor to enter upon, or perform work above Chicago Transit Authority property, the contractor must first provide payment of \$1,000; this payment is the fee for the CTA to process a Right of Entry document; this fee is non-refundable.

In order for CTA to process the Right of Entry document, the contractor must furnish scope of work, insurance, Letter of Commitment, and deposit for Flagger/Inspector charges (all of these requirements are covered in this R.O.W. requirements document).

Please include a property plat or site plan that is the subject of your request, which identifies your client's property and CTA's property.

Five (5) weeks prior to the start of any work that may impact CTA Rail Operations (work in close proximity to CTA tracks that may cause service disruptions, etc.), the Contractor is required to attend a weekly Rail Operations meeting at the CTA Headquarters (date/time to be furnished); the Contractor is to bring a 5-week look-ahead schedule detailing dates/times of work, # of CTA Flaggers required, direction of track affected by work, whether track needs to be closed and/or whether power needs to be shut off (all of the aforementioned are contingent upon the prior approval of CTA).

Further, any work that affects the safety or causes disruptions of service or inconvenience to transit users, CTA Operations or impacts CTA Right-of-Way requires a "Construction Process Plan" Twenty-One (21) days PRIOR to work. A Construction Process Plan contains scope of work, timing of work (days and hours), impacts to CTA operations (and/or how you will mitigate impacts), contingency plans, weather limitations, contact info, Drawings/Sketches of work and relation to CTA tracks, Job Hazard Analysis, Hospital route map, equipment specs, lift plan, etc.

Respectfully,



Abdin Carrillo  
Project Manager, Construction Oversight

copies: C. Bushell  
R. Wittmann  
S. Mascheri  
J. Harper

**CHICAGO TRANSIT AUTHORITY  
INSURANCE AND BOND REQUIREMENTS**  
[Short Form – General Right of Entry]

ROE DESCRIPTION: **SAMPLE**

**PART I. REQUIRED INSURANCE COVERAGES**

**A. WORKERS COMPENSATION**

Coverage A: **STATUTORY** in form and in accordance with the laws of the State of Illinois.

Coverage B: Employers Liability:

**\$1,000,000** Bodily Injury by Accident  
**\$1,000,000** Bodily Injury by Disease, Policy Limit

**B. COMPREHENSIVE OR COMMERCIAL GENERAL LIABILITY:**

**\$2,000,000** General Aggregate (Per Location)  
**\$2,000,000** Products/Completed Operations Aggregate  
**\$1,000,000** Personal Injury and Advertising Injury  
**\$1,000,000** Per Occurrence

The Commercial General Liability policy shall include, without limitation: (i) Broad Form Contractual Liability, (ii) Products/Completed Operations to be maintained in full force and effect for a period of two (2) years following final completion of the work under the Contract, (iii) Independent Contractors' Protective Liability, (iv) Premises/Operations, including deletion of explosion, collapse and underground (XCU) exclusions, (v) Broad Form Property Damage, including Products/Completed Operations, (vi) Personal Injury Liability, (vii) Severability of Interest and Cross Liability endorsement and (viii) Contractor expressly agrees to waive, and will require its insurer to waive, its rights, benefits and entitlement under the "Other Insurance" clause of its Commercial General Liability policy, with respect to the CTA.

**If any work is to be performed within fifty (50) feet of rail right-of-way Contractor must:**

1. Provide Railroad Protective Liability Insurance policy in the amount of **\$2,000,000 per occurrence / \$6,000,000 aggregate**

**C. AUTOMOBILE LIABILITY**

**\$1,000,000** Combined Single Limit (Bodily Injury and Property Damage)

## **PART II. GENERAL INSTRUCTIONS AND REQUIREMENTS**

### **A. WAYS TO COMPLY WITH CTA INSURANCE REQUIREMENTS.**

#### **1. HOW TO COMPLY IF CGL, OWNERS PROTECTIVE LIABILITY, BUILDER'S RISK INSURANCE AND/OR PROFESSIONAL LIABILITY ARE REQUIRED BY PART III OF THIS DOCUMENT.**

There are three ways to satisfy the CTA's insurance requirements for Comprehensive General Liability, Owners Protective Liability, Builder's Risk and Professional Liability. For Comprehensive General Liability, Owners Protective Liability, Builder's Risk and Professional Liability the Contractor must provide the CTA with one of the following insurance documents:

- a) Certified copy of the insurance policy,
- b) An insurance binder, *or*
- c) The CTA Certificate of Coverage on the CTA approved form. The CTA Certificate of Coverage may be completed only by an authorized representative of the insurance company, an agent, broker, or underwriter.

#### **2. HOW TO COMPLY IF *RAILROAD PROTECTIVE INSURANCE* IS REQUIRED BY PART III OF THIS DOCUMENT.**

There are two ways to satisfy the CTA's insurance requirements for Railroad Protective. The Contractor must provide the CTA with one of the following insurance documents:

- a) Certified copy of the insurance policy *or*
- b) An insurance binder

Method b) is a temporary method that is valid only for 90 days. A certified copy of the railroad protective insurance policy must be furnished prior to the expiration of this 90-day period.

#### **3. HOW TO COMPLY FOR ALL OTHER TYPES OF REQUIRED INSURANCE.**

For all other insurance required by Part III of this document, an ACORD™ certificate is acceptable.

### **B. DEADLINE FOR INITIAL SUBMITTAL OF CONTRACTOR'S INSURANCE AND BOND DOCUMENTS.**

The Contractor must furnish all required insurance, performance, and payment bond documents within fourteen days of the date that the Contractor receives a letter (the "Insurance Submittal Letter") from the CTA's General Manager of Purchasing requesting the Contractor to submit the documents required by these Insurance and Bond Requirements. CTA will not execute the Contract until the required insurance and bond documents are delivered to CTA and approved by CTA. Failure to deliver the required documents within fourteen days of receipt of the Insurance Submittal Letter is a material failure to comply with the specifications and may result in any or all of the following at the CTA's sole discretion:

- 1) Debarment or suspension, and
- 2) Determination of Contractor non-responsibility.



**C. CTA ADDRESS.**

All notices and documents must be mailed to the CTA at:

Tamika Press  
Insurance Coordinator  
Risk Management Department  
567 W. Lake Street  
Chicago, IL. 60661-1498

**D. OBLIGATION TO MAINTAIN CONTINUOUS COMPLIANCE**

1. The Contractor expressly agrees that failure to comply and maintain compliance with all insurance and bond requirements shall constitute a material breach of the Contract which may result in default and, if uncured, termination for default under the contract. In addition, such failure, if uncured, may result in debarment and suspension.
2. The Contractor is prohibited from performing any work if Contractor has allowed any of the required insurance policies to expire.

**PART III. MISCELLANEOUS INSURANCE REQUIREMENTS**

- A.** The CTA must be named as an Additional Insured and Certificate Holder. When the CTA is an additional insured, the coverage shall be primary.
- B.** The CTA must be the Named Insured on the Owners Protective Liability, Railroad Protective Liability, or Builders Risk Insurance policies.
- C.** The Commercial General Liability and Owners Protective Liability, General Aggregate Limit of Liability, if any, must apply on a per location, per project basis by endorsement to the policy.
- D.** All insurance carriers must be acceptable to the CTA. All insurance companies shall have at least a B+ VII POLICY HOLDER RATING, or better, by the A.M. Best Co., Inc. Insurance companies with lower ratings will not be accepted. Carriers licensed to do business in the State of Illinois must issue all insurance, with the exception of Railroad Protective.
- E.** To the extent permitted by the Contractor's insurance policies required by the CTA, the Contractor and its insurers waive all rights of subrogation against the CTA.
- F.** The insurance to be carried shall in no way be subject to limitations, if any, expressed in the indemnity section of the General Conditions (or any statutory, judicial or common law limitations).
- G.** CTA MUST BE ADDITIONAL INSURED ON GENERAL LIABILITY.

# INSURANCE CERTIFICATE OF COVERAGE

Named Insured: \_\_\_\_\_ RFP#: \_\_\_\_\_  
Address: \_\_\_\_\_  
(NUMBER & STREET)  
\_\_\_\_\_  
(CITY) (STATE) (ZIP)

Specification #: \_\_\_\_\_  
Project #: \_\_\_\_\_  
Contract #: \_\_\_\_\_

Description of  
Operation/Location

The insurance policies and endorsements indicated below have been issued to the designated named insured with the policy limits as set forth herein covering the operation described within the contract involving the named insured and the Chicago Transit Authority. The Certificate issuer agrees that in the event of cancellation, non-renewal or material change involving the indicated policies, the issuer will provide at least sixty (60) days prior written notice of such change to the Chicago Transit Authority at the address shown on this Certificate. This certificate is issued to the Chicago Transit Authority in consideration of the contract entered into with the named insured, and it is mutually understood that the Chicago Transit Authority relies on this certificate as a basis for continuing such agreement with the named insured.

Type of insurance	Insurer Name	Policy Number	Policy Period	Limits of Liability All Limits in Thousands
<u>Commercial General Liability</u> <input type="checkbox"/> Occurrence <input type="checkbox"/> Claims made <input type="checkbox"/> Premise-Operations <input type="checkbox"/> Explosion/Collapse Underground <input type="checkbox"/> Products/Completed Operations <input type="checkbox"/> Blanket Contractual <input type="checkbox"/> Broad Form Property Damage <input type="checkbox"/> Independent Contractors <input type="checkbox"/> Personal Injury <input type="checkbox"/> Pollution				Each Occurrence \$ _____ General Aggregate \$ _____ Products/Completed Operations Aggregate \$ _____
<b>Commercial General Liability</b> <b>Form #: CG 00 01 _____</b>				
Automobile Liability (Any Auto)				Each Occurrence \$ _____
<u>Excess Liability</u> <input type="checkbox"/> Umbrella Liability				Each Occurrence \$ _____
Workers' Compensation and Employer's Liability				Statutory/Illinois Employers Liability \$ _____
Builders' Risk/Course of Construction				Amount of Contract \$ _____
Professional Liability				\$ _____
Owner Contractors Protective				\$ _____
Other				_____

- a) Each insurance policy required by this agreement, except policies for workers' compensation and professional liability, will read:  
"The Chicago Transit Authority is an additional insured as respects to operations and activities of, or on behalf of the named insured, performed under contract with or permit from the Chicago Transit Authority".
- b) The General, Automobile and Excess/Umbrella Liability Policies described provide for separation of insureds applicable to the named insured and the CTA.
- c) Workers Compensation and Property insurer shall waive all rights of subrogation against the Chicago Transit Authority.
- d) The receipt of this certificate by the CTA does not constitute agreement by the CTA that the insurance requirements in the contract have been fully met, or that the insurance companies indicated by this certificate are in compliance with all contract requirements.

Name and Address of Certificate Holder and Receipt of Notice

Signature of Authorized Representative

Certificate Holder/Additional Insured

**Chicago Transit Authority**  
**Risk Management**  
**P.O. Box 7564**  
**Chicago, IL 60680**

Agent/Company Address

Telephone \_\_\_\_\_



## **Letter of Commitment**

**A Signed Contractual Agreement or Written Letter of Commitment serves as a formal agreement between the company and the CTA for the work to be performed.**

The following Information should be included in your Letter:

1. Company's name, address, phone, and fax number
2. Company's contact person/project manager
3. Scope, Location, and Duration of the Project
4. Authorization to employ our service and bill your company
5. Authorized signature from project manager or officer of company



## **SAMPLE: Letter of Commitment**

Chicago Transit Authority  
567 W. Lake  
Chicago, IL 60661

Contractor:           Company Name  
                              Address  
                              City, State, Zip Code  
Phone:                 (XXX) XXX-XXXX  
Fax:                    (XXX) XXX-XXXX

Contact person/Project Manager:

Work Location:       Address  
                              City, State, Zip Code

Scope of Work:

Duration of Project:   XXXX

To Whom It May Concern:

**(Insert company name)** is the Contractor for the building at **(insert address/project location)**, and intends to **(insert type of work to be performed)** at the said location. The property is adjacent to the CTA's **(i.e. Red, Brown, Purple, Blue, Orange, Yellow, or Pink)** line. The work will be completed in **(insert number)** days.

If any of CTA's services are required, I authorize the employment of and payment for such services.

Sincerely,

XXXXXX  
(Company Name to be billed for services)



## **CTA Deposit Requirements**

All Contractors performing work on or near the Chicago Transit Authority's (CTA) property will be required to provide a deposit in advance equal to CTA's estimate. No contractor will be permitted to work prior to submission of the deposit. The estimated amount includes, but is not limited to the following CTA services: Flagging Charges, Slow Zone Charges (signage and initial supplies), Inspector Charges, and other services as required (i.e. electricians, signal maintainers, switch persons, etc.)

### **Flagging Charges**

The Contractor must provide CTA with a minimum of seventy-two (72) week day hours to schedule flagmen for a project (this means that flagmen required for the following Monday must be requested by 12:00PM (Noon) the previous Wednesday). Flagmen are scheduled for a minimum of eight (8) hours. Cancellations of flagmen orders require a twenty-four (24) hour advance notice, otherwise, the Contractor will be charged for the scheduled workers.

### **Slow Zones and Supplies**

If a project requires the use of slow zones (work that is in close proximity to CTA tracks that requires Trains to reduce speeds), CTA will supply the signage for a fee. The contractor will be charged a fee of \$1,600.00 for each set of slow zone signage and associated equipment issued. The initial set of batteries for the lighting supplies will be provided by the CTA; however the contractor will need to supply any subsequent batteries/bulbs. Additionally, the contractor will be responsible for setting up, maintaining, removing, and securing the slow zones (Note: Contractor workers must have completed the Rail Right-of-Way Safety Training Session). The contractor will be refunded the balance remaining from the slow zone charge, less \$200.00 per ninety (90) days of usage and the cost of unreturned equipment.

### **Inspector Charges**

Projects scheduled during weekend hours count as overtime for CTA inspectors. Weekend hours begin Saturday at 5:00 AM and end Monday at 5:00 AM. CTA requires a five (5) day advance notice from Contractors to schedule inspectors for weekend projects. If the Contractor's initial deposit amount is expended prior to the completion of the project, CTA will require an additional deposit to cover the remaining work for the project. CTA will not provide services if additional funds are not provided. After official project completion, all unused funds will be returned to the contractor.

All checks must be payable to the:

Chicago Transit Authority,  
567 West Lake Street  
Chicago, IL. 60661

To ensure prompt service, please include the estimate sheet, your Commitment Letter, and address it to the attention of Abdin Carrillo. If you have any questions, please contact me at (312) 681.3913

Sincerely

Abdin Carrillo  
Manager, Construction Management Oversight



## Rail Safety Training

All Contractor/Subcontractor/Consultant personnel assigned to work on, under, above, or adjacent to the CTA Right-Of-Way (R.O.W) and inside Rail Maintenance Facilities adjacent to six-hundred (600) VDC, are required to successfully complete a one-day (8-hour) Rail Safety Training (R.S.T.) Course administered by CTA in order to qualify for a Rail Right-Of- Way Safety Card. The course identifies the dangers that exist on the Rail System, including moving trains and the 600-volt DC Traction Power Distribution System. The CTA Representative (Abdin Carrillo) will determine if specific situations may not require R.S.T. (e.g., all work will be outside CTA's R.O.W. and there is NO chance that personnel, material or equipment will penetrate CTA R.O.W. or impact Rail Operations).

The General Contractor is responsible for requesting Rail Safety Training for Contractor/Subcontractor employees by either calling or providing an email to Ora Hardaway, CTA (contact info below). The General Contractor (no Subcontractors are to contact CTA) shall give the full names and the last 4 digits of the social security numbers for each individual proposed for the training. The Contractor shall include a check payable to the "Chicago Transit Authority", for the individual charges of the "Rail Safety Training Fee" multiplied by the number of individuals proposed for training. The "Rail Safety Training Fee" is currently \$200.00 (payable in advance) and is non-refundable. Individuals that fail to report for training or are rejected for training must reschedule (additional training fees will apply).

### Scheduling Procedures

1. Contact: Ora Hardaway, [ohardaway@transitchicago.com](mailto:ohardaway@transitchicago.com), (312) 681-3951 to register for class at least two (2) weeks in advance (it is recommended that Contractors schedule even further in advance due to high volume of work).
2. Once approved, you will receive a faxed or email confirmation and information packet.



Route FAP 1405  
Section 98-B7106-04-RS  
County Cook

Marked Rte. Lake Street  
Project No. B-4-118  
Contract No. \_\_\_\_\_

This plan has been prepared to comply with the provisions of the National Pollutant Discharge Elimination System (NPDES) Permit No. ILR10 (Permit ILR10), issued by the Illinois Environmental Protection Agency (IEPA) for storm water discharges from construction site activities.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Mr. Daniel Burke, P.E., S.E.

Print Name

Deputy Commissioner - Division of Engineering

Title

Chicago Department of Transportation

Agency

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

**I. Site Description:**

- A. Provide a description of the project location (include latitude and longitude):

The project is located along Lake Street from approximately 467 feet west of Damen Avenue (Lat: 41.884919, Long: -87.678221) to approximately 223 feet west of Ashland Avenue (Lat: 41.885362, Long: -87.665899) in the near west side of Chicago. The project also includes improvements along the side streets as necessary due to the work occurring on Lake Street.

- B. Provide a description of the construction activity which is the subject of this plan:

- Full depth replacement of the existing base course and resurfacing of the existing roadway.
- Construction of new transfer girders and columns for the CTA structure across Damen Avenue.
- Replacement of existing catch basins with new catch basins and improvements to drainage flow lines.
- Traffic signal modernization and street lighting.
- Streetscaping with new trees.

- C. Provide the estimated duration of this project:

Fall 2017 - Summer 2018

- D. The total area of the construction site is estimated to be 5.9 acres.

The total area of the site estimated to be disturbed by excavation, grading or other activities is 5.9 acres.

- E. The following is a weighted average of the runoff coefficient for this project after construction activities are completed:

The runoff coefficient of this area was not determined as a full drainage design was not part of the scope. The mainline sewer will remain in place. The runoff coefficient will decrease slightly as a result of this project, as some areas that are currently concrete sidewalk will be converted into grass parkway.

- F. List all soils found within project boundaries. Include map unit name, slope information, and erosivity:

The soils are generally clayey sands and silty clays. The erosivity of these soils was not tested.

- G. Provide an aerial extent of wetland acreage at the site:

There are no wetlands within the project site.

H. Provide a description of potentially erosive areas associated with this project:

There are no areas that are expected to be especially erosive.

I. The following is a description of soil disturbing activities by stages, their locations, and their erosive factors (e.g. steepness of slopes, length of slopes, etc):

The existing soils will be disturbed at locations of light pole and signal pole foundations, CTA column locations, tree installation, catch basin construction, and roadway and base course construction. Roadway and base course construction present the highest chance for erosion as large areas of earth will be exposed at one time. The remaining items are all very localized and generally the underlying soils are protected by some other element. The area is relatively flat, however, so the chance for erosion of soils is low.

J. See the erosion control plans and/or drainage plans for this contract for information regarding drainage patterns, approximate slopes anticipated before and after major grading activities, locations where vehicles enter or exit the site and controls to prevent offsite sediment tracking (to be added after contractor identifies locations), areas of soil disturbance, the location of major structural and non-structural controls identified in the plan, the location of areas where stabilization practices are expected to occur, surface waters (including wetlands) and locations where storm water is discharged to surface water including wetlands.

K. Identify who owns the drainage system (municipality or agency) this project will drain into:

City of Chicago - Department of Water Management

L. The following is a list of General NPDES ILR40 permittees within whose reporting jurisdiction this project is located.

All water runoff from the project outlets to the City of Chicago combined sewer system is treated at a MWRD treatment plant before outletting to the Chicago Sanitary and Ship Canal.

M. The following is a list of receiving water(s) and the ultimate receiving water(s) for this site. The location of the receiving waters can be found on the erosion and sediment control plans:

N/A

N. Describe areas of the site that are to be protected or remain undisturbed. These areas may include steep slopes, highly erodible soils, streams, stream buffers, specimen trees, natural vegetation, nature preserves, etc.

There are existing landscaped areas that will be protected with tree protection. There are no streams, nature preserves, or highly erodible soils on the site.

O. The following sensitive environmental resources are associated with this project, and may have the potential to be impacted by the proposed development:

- ☐ Floodplain
- ☐ Wetland Riparian
- ☐ Threatened and Endangered Species
- ☐ Historic Preservation
- ☐ 303(d) Listed receiving waters for suspended solids, turbidity, or siltation
- ☐ Receiving waters with Total Maximum Daily Load (TMDL) for sediment, total suspended solids, turbidity or siltation
- ☐ Applicable Federal, Tribal, State or Local Programs
- ☐ Other

1. 303(d) Listed receiving waters (fill out this section if checked above):

N/A

a. The name(s) of the listed water body, and identification of all pollutants causing impairment:

N/A

b. Provide a description of how erosion and sediment control practices will prevent a discharge of sediment resulting from a storm event equal to or greater than a twenty-five (25) year, twenty-four (24) hour rainfall event:



N/A

- c. Provide a description of the location(s) of direct discharge from the project site to the 303(d) water body:

N/A

- d. Provide a description of the location(s) of any dewatering discharges to the MS4 and/or water body:

N/A

2. TMDL (fill out this section if checked above)

- a. The name(s) of the listed water body:

N/A

- b. Provide a description of the erosion and sediment control strategy that will be incorporated into the site design that is consistent with the assumptions and requirements of the TMDL:

N/A

- c. If a specific numeric waste load allocation has been established that would apply to the project's discharges, provide a description of the necessary steps to meet that allocation:

N/A

P. The following pollutants of concern will be associated with this construction project:

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Soil Sediment             | <input checked="" type="checkbox"/> Petroleum (gas, diesel, oil, kerosene, hydraulic oil / fluids) |
| <input checked="" type="checkbox"/> Concrete                  | <input type="checkbox"/> Antifreeze / Coolants   |
| <input checked="" type="checkbox"/> Concrete Truck Waste      | <input checked="" type="checkbox"/> Waste water from cleaning construction equipment               |
| <input checked="" type="checkbox"/> Concrete Curing Compounds | <input type="checkbox"/> Other (specify)   |
| <input checked="" type="checkbox"/> Solid Waste Debris        | <input type="checkbox"/> Other (specify)   |
| <input checked="" type="checkbox"/> Paints                    | <input type="checkbox"/> Other (specify)   |
| <input checked="" type="checkbox"/> Solvents                  | <input type="checkbox"/> Other (specify)   |
| <input type="checkbox"/> Fertilizers / Pesticides             | <input type="checkbox"/> Other (specify)   |

## II. Controls:

This section of the plan addresses the controls that will be implemented for each of the major construction activities described in I.C. above and for all use areas, borrow sites, and waste sites. For each measure discussed, the Contractor will be responsible for its implementation as indicated. The Contractor shall provide to the Resident Engineer a plan for the implementation of the measures indicated. The Contractor, and subcontractors, will notify the Resident Engineer of any proposed changes, maintenance, or modifications to keep construction activities compliant with the Permit ILR10. Each such Contractor has signed the required certification on forms which are attached to, and are a part of, this plan:

A. **Erosion and Sediment Controls:** At a minimum, controls must be coordinated, installed and maintained to:

1. Minimize the amount of soil exposed during construction activity;
2. Minimize the disturbance of steep slopes;
3. Maintain natural buffers around surface waters, direct storm water to vegetated areas to increase sediment removal and maximize storm water infiltration, unless infeasible;
4. Minimize soil compaction and, unless infeasible, preserve topsoil.

B. **Stabilization Practices:** Provided below is a description of interim and permanent stabilization practices, including site- specific scheduling of the implementation of the practices. Site plans will ensure that existing vegetation is preserved where attainable and disturbed portions of the site will be stabilized. Stabilization practices may include but are not limited to: temporary seeding, permanent seeding, mulching, geotextiles, sodding, vegetative buffer strips, protection of trees, preservation of mature vegetation, and other appropriate measures. Except as provided below in II(B)(1) and II(B)(2), stabilization measures shall be initiated **immediately** where construction activities have temporarily or permanently ceased, but in no case more than **one (1) day** after the construction activity in that portion of the site has temporarily or permanently ceases on all disturbed portions of the site where construction will not occur for a period of fourteen (14) or more calendar days.

1. Where the initiation of stabilization measures is precluded by snow cover, stabilization measures shall be initiated as soon as practicable.
2. On areas where construction activity has temporarily ceased and will resume after fourteen (14) days, a temporary stabilization method can be used.

The following stabilization practices will be used for this project:

- |   |   |
|---|---|
| <input checked="" type="checkbox"/> Preservation of Mature Vegetation | <input type="checkbox"/> Erosion Control Blanket / Mulching |
| <input type="checkbox"/> Vegetated Buffer Strips                      | <input checked="" type="checkbox"/> Sodding                 |
| <input type="checkbox"/> Protection of Trees                          | <input type="checkbox"/> Geotextiles                        |
| <input type="checkbox"/> Temporary Erosion Control Seeding            | <input type="checkbox"/> Other (specify)                    |
| <input type="checkbox"/> Temporary Turf (Seeding, Class 7)            | <input type="checkbox"/> Other (specify)                    |
| <input type="checkbox"/> Temporary Mulching                           | <input type="checkbox"/> Other (specify)                    |
| <input type="checkbox"/> Permanent Seeding                            | <input type="checkbox"/> Other (specify)                    |

Describe how the stabilization practices listed above will be utilized during construction:

Due to the nature of this project no special stabilization practices will be used. The storm water run-off will drain into either new or proposed catch basins. These catch basins contain sumps and are connected to a combined sewer system. The combined sewer system releases to MWRD treatment plants. All sumps within catch basins will be cleaned at the end of the project.

Describe how the stabilization practices listed above will be utilized after construction activities have been completed:

N/A

C.

**Structural Practices:** Provided below is a description of structural practices that will be implemented, to the degree attainable, to divert flows from exposed soils, store flows or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Such practices may include but are not limited to: perimeter erosion barrier, earth dikes, drainage swales, sediment traps, ditch checks, subsurface drains, pipe slope drains, level spreaders, storm drain inlet protection, rock outlet protection, reinforced soil retaining systems, gabions, and temporary or permanent sediment basins. The installation of these devices may be subject to Section 404 of the Clean Water Act.

The following structural practices will be used for this project:

- |  |  |
|--|--|
| <input type="checkbox"/> Perimeter Erosion Barrier     | <input type="checkbox"/> Rock Outlet Protection  |
| <input type="checkbox"/> Temporary Ditch Check         | <input type="checkbox"/> Riprap                  |
| <input type="checkbox"/> Storm Drain Inlet Protection  | <input type="checkbox"/> Gabions                 |
| <input type="checkbox"/> Sediment Trap                 | <input type="checkbox"/> Slope Mattress          |
| <input type="checkbox"/> Temporary Pipe Slope Drain    | <input type="checkbox"/> Retaining Walls         |
| <input type="checkbox"/> Temporary Sediment Basin      | <input type="checkbox"/> Slope Walls             |
| <input type="checkbox"/> Temporary Stream Crossing     | <input type="checkbox"/> Concrete Revetment Mats |
| <input type="checkbox"/> Stabilized Construction Exits | <input type="checkbox"/> Level Spreaders         |
| <input type="checkbox"/> Turf Reinforcement Mats       | <input type="checkbox"/> Other (specify)         |
| <input type="checkbox"/> Permanent Check Dams          | <input type="checkbox"/> Other (specify)         |
| <input type="checkbox"/> Permanent Sediment Basin      | <input type="checkbox"/> Other (specify)         |
| <input type="checkbox"/> Aggregate Ditch               | <input type="checkbox"/> Other (specify)         |
| <input type="checkbox"/> Paved Ditch                   | <input type="checkbox"/> Other (specify)         |

Describe how the structural practices listed above will be utilized during construction:

Due to the nature of this project no special stabilization practices will be used. The storm water run-off will drain into either new or proposed catch basins. These catch basins contain sumps and are connected to a combined sewer system. The combined sewer system releases to MWRD treatment plants. All sumps within catch basins will be cleaned at the end of the project.

Describe how the structural practices listed above will be utilized after construction activities have been completed:

Due to the nature of this project no structural practices will be used.

**D. Treatment Chemicals**

Will polymer flocculants or treatment chemicals be utilized on this project: ☐ Yes ☐ No

If yes above, identify where and how polymer flocculants or treatment chemicals will be utilized on this project.

**E. Permanent Storm Water Management Controls:** Provided below is a description of measures that will be installed during the construction process to control volume and pollutants in storm water discharges that will occur after construction operations have been completed. The installation of these devices may be subject to Section 404 of the Clean Water Act.

1. Such practices may include but are not limited to: storm water detention structures (including wet ponds), storm water retention structures, flow attenuation by use of open vegetated swales and natural depressions, infiltration of runoff on site, and sequential systems (which combine several practices).

The practices selected for implementation were determined on the basis of the technical guidance in Chapter 41 (Construction Site Storm Water Pollution Control) of the IDOT Bureau of Design and Environment Manual. If practices other than those discussed in Chapter 41 are selected for implementation or if practices are applied to situations different from those covered in Chapter 41, the technical basis for such decisions will be explained below.

2. Velocity dissipation devices will be placed at discharge locations and along the length of any outfall channel as necessary to provide a non-erosive velocity flow from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected (e.g. maintenance of hydrologic conditions such as the hydroperiod and hydrodynamics present prior to the initiation of construction activities).

Description of permanent storm water management controls:

Due to the nature of this project no special stabilization practices will be used. The storm water run-off will drain into either new or proposed catch basins. These catch basins contain sumps and are connected to a combined sewer system. The combined sewer system releases to MWRD treatment plants. All sumps within catch basins will be cleaned at the end of the project.

**F. Approved State or Local Laws:** The management practices, controls and provisions contained in this plan will be in accordance with IDOT specifications, which are at least as protective as the requirements contained in the Illinois Environmental Protection Agency's Illinois Urban Manual. Procedures and requirements specified in applicable sediment and erosion site plans or storm water management plans approved by local officials shall be described or incorporated by reference in the space provided below. Requirements specified in sediment and erosion site plans, site permits, storm water management site plans or site permits approved by local officials that are applicable to protecting surface water resources are, upon submittal of an NOI, to be authorized to discharge under the Permit ILR10 incorporated by reference and are enforceable under this permit even if they are not specifically included in the plan.

Description of procedures and requirements specified in applicable sediment and erosion site plans or storm water management plans approved by local officials:

Due to the nature of this project no special stabilization practices will be used. The storm water run-off will drain into either new or proposed catch basins. These catch basins contain sumps and are connected to a combined sewer system. The combined sewer system releases to MWRD treatment plants. All sumps within catch basins will be cleaned at the end of the project.

**G. Contractor Required Submittals:** Prior to conducting any professional services at the site covered by this plan, the Contractor and each subcontractor responsible for compliance with the permit shall submit to the Resident Engineer a Contractor Certification Statement, BDE 2342a.

1. The Contractor shall provide a construction schedule containing an adequate level of detail to show major activities with implementation of pollution prevention BMPs, including the following items:

- Approximate duration of the project, including each stage of the project
- Rainy season, dry season, and winter shutdown dates
- Temporary stabilization measures to be employed by contract phases
- Mobilization timeframe
- Mass clearing and grubbing/roadside clearing dates
- Deployment of Erosion Control Practices
- Deployment of Sediment Control Practices (including stabilized construction entrances/exits)
- Deployment of Construction Site Management Practices (including concrete washout facilities, chemical storage, refueling locations, etc.)
- Paving, saw-cutting, and any other pavement related operations
- Major planned stockpiling operations
- Timeframe for other significant long-term operations or activities that may plan non-storm water discharges such as dewatering, grinding, etc.
- Permanent stabilization activities for each area of the project

2. The Contractor and each subcontractor shall provide, as an attachment to their signed Contractor Certification Statement, a discussion of how they will comply with the requirements of the permit in regard to the following items and provide a graphical representation showing location and type of BMPs to be used when applicable:

- Vehicle Entrances and Exits – Identify type and location of stabilized construction entrances and exits to be used and how they will be maintained.
- Material Delivery, Storage and Use – Discuss where and how materials including chemicals, concrete curing compounds, petroleum products, etc. will be stored for this project.
- Stockpile Management – Identify the location of both on-site and off-site stockpiles. Discuss what BMPs will be used to prevent pollution of storm water from stockpiles.
- Waste Disposal – Discuss methods of waste disposal that will be used for this project.
- Spill Prevention and Control – Discuss steps that will be taken in the event of a material spill (chemicals, concrete curing compounds, petroleum, etc.)
- Concrete Residuals and Washout Wastes – Discuss the location and type of concrete washout facilities to be used on this project and how they will be signed and maintained.
- Litter Management – Discuss how litter will be maintained for this project (education of employees, number of dumpsters, frequency of dumpster pick-up, etc.).
- Vehicle and Equipment Fueling – Identify equipment fueling locations for this project and what BMPs will be used to ensure containment and spill prevention.
- Vehicle and Equipment Cleaning and Maintenance – Identify where equipment cleaning and maintenance locations for this project and what BMPs will be used to ensure containment and spill prevention.
- Dewatering Activities – Identify the controls which will be used during dewatering operations to ensure sediments will not leave the construction site.
- Polymer Flocculants and Treatment Chemicals – Identify the use and dosage of treatment chemicals and provide the Resident Engineer with Material Safety Data Sheets. Describe procedures on how the chemicals will be used and identify who will be responsible for the use and application of these chemicals. The selected individual must be trained on the established procedures.
- Additional measures indicated in the plan.

### **III. Maintenance:**

When requested by the Contractor, the Resident Engineer will provide general maintenance guides to the Contractor for the practices associated with this project. The following additional procedures will be used to maintain, in good and effective operating conditions, the vegetation, erosion and sediment control measures and other protective measures identified in this plan. It will be the Contractor's responsibility to attain maintenance guidelines for any manufactured BMPs which are to be installed and maintained per manufacture's specifications.

Due to the nature of this project no special stabilization practices will be used. The storm water run-off will drain into either new or proposed catch basins. These catch basins contain sumps and are connected to a combined sewer system. The combined sewer system releases to MWRD treatment plants. All sumps within catch basins will be cleaned at the end of the project.

### **IV. Inspections:**

Qualified personnel shall inspect disturbed areas of the construction site which have not yet been finally stabilized, structural control measures, and locations where vehicles and equipment enter and exit the site using IDOT Storm Water Pollution Prevention Plan Erosion Control Inspection Report (BC 2259). Such inspections shall be conducted at least once every seven (7) calendar days and within twenty-four (24) hours of the end of a storm or by the end of the following business or work day that is 0.5 inch or greater or equivalent snowfall.

Inspections may be reduced to once per month when construction activities have ceased due to frozen conditions. Weekly inspections will recommence when construction activities are conducted, or if there is 0.5" or greater rain event, or a discharge due to snowmelt occurs.

If any violation of the provisions of this plan is identified during the conduct of the construction work covered by this plan, the Resident Engineer shall notify the appropriate IEPA Field Operations Section office by email at: [epa.swnoncomp@illinois.gov](mailto:epa.swnoncomp@illinois.gov), telephone or fax within twenty-four (24) hours of the incident. The Resident Engineer shall then complete and submit an "Incidence of Non-Compliance" (ION) report for the identified violation within five (5) days of the incident. The Resident Engineer shall use forms provided by IEPA and shall include specific information on the cause of noncompliance, actions which were taken to prevent any further causes of noncompliance, and a statement detailing any environmental impact which may have resulted from the noncompliance. All reports of non-compliance shall be signed by a responsible authority in accordance with Part VI. G of the Permit ILR10.

The Incidence of Non-Compliance shall be mailed to the following address:

Illinois Environmental Protection Agency  
Division of Water Pollution Control  
Attn: Compliance Assurance Section  
1021 North Grand East  
Post Office Box 19276  
Springfield, Illinois 62794-9276

Additional Inspections Required:

N/A

**V. Failure to Comply:**

Failure to comply with any provisions of this Storm Water Pollution Prevention Plan will result in the implementation of a National Pollutant Discharge Elimination System/Erosion and Sediment Control Deficiency Deduction against the Contractor and/or penalties under the Permit ILR10 which could be passed on to the Contractor.



## Contractor Certification Statement

Prior to conducting any professional services at the site covered by this contract, the Contractor and every subcontractor must complete and return to the Resident Engineer the following certification. A separate certification must be submitted by each firm. Attach to this certification all items required by Section II.G of the Storm Water Pollution Prevention Plan (SWPPP) which will be handled by the Contractor/subcontractor completing this form.

Route	<u>FAP 1405</u>	Marked Rte.	<u>Lake Street</u>
Section	<u>98-B7106-04-RS</u>	Project No.	<u>B-4-118</u>
County	<u>Cook</u>	Contract No.	<u></u>

This certification statement is a part of SWPPP for the project described above, in accordance with the General NPDES Permit No. ILR10 issued by the Illinois Environmental Protection Agency.

I certify under penalty of law that I understand the terms of the Permit No. ILR 10 that authorizes the storm water discharges associated with industrial activity from the construction site identified as part of this certification.

In addition, I have read and understand all of the information and requirements stated in SWPPP for the above mentioned project; I have received copies of all appropriate maintenance procedures; and, I have provided all documentation required to be in compliance with the Permit ILR10 and SWPPP and will provide timely updates to these documents as necessary.

- ☐ Contractor
- ☐ Sub-Contractor

<u>Print Name</u>	<u>Signature</u>
<u>Title</u>	<u>Date</u>
<u>Name of Firm</u>	<u>Telephone</u>
<u>Street Address</u>	<u>City/State/ZIP</u>

Items which this Contractor/subcontractor will be responsible for as required in Section II.G. of SWPPP:

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