

# **BID PROPOSAL INSTRUCTIONS**

**ABOUT IDOT PROPOSALS:** All proposals are potential bidding proposals. Each proposal contains all certifications and affidavits, a proposal signature sheet and a proposal bid bond.

## **PREQUALIFICATION**

Any contractor who desires to become pre-qualified to bid on work advertised by IDOT must submit the properly completed pre-qualification forms to the Bureau of Construction no later than 4:30 p.m. prevailing time twenty-one days prior to the letting of interest. This pre-qualification requirement applies to first time contractors, contractors renewing expired ratings, contractors maintaining continuous pre-qualification or contractors requesting revised ratings. To be eligible to bid, existing pre-qualification ratings must be effective through the date of letting.

## **WHO CAN BID ?**

Bids will be accepted from only those companies that request and receive written Authorization to Bid from IDOT's Central Bureau of Construction.

## **REQUESTS FOR AUTHORIZATION TO BID**

Contractors wanting to bid on items included in a particular letting must submit the properly completed "Request for Authorization to Bid/or Not For Bid Status" (BDE 124) and the ORIGINAL "Affidavit of Availability" (BC 57) to the proper office no later than 4:30 p.m. prevailing time, three (3) days prior to the letting date.

## **WHAT CONSTITUTES WRITTEN AUTHORIZATION TO BID?**

When a prospective prime bidder submits a "Request for Authorization to Bid/or Not For Bid Status"(BDE 124) he/she must indicate at that time which items are being requested For Bidding purposes. Only those items requested For Bidding will be analyzed. After the request has been analyzed, the bidder will be issued an **Authorization to Bid or Not for Bid Report**, approved by the Central Bureau of Construction and the Chief Procurement Officer that indicates which items have been approved For Bidding. If **Authorization to Bid** cannot be approved, the **Authorization to Bid or Not for Bid Report** will indicate the reason for denial.

## **ABOUT AUTHORIZATION TO BID**

Firms that have not received an Authorization to Bid or Not For Bid Report within a reasonable time of complete and correct original document submittal should contact the Department as to the status. Firms unsure as to authorization status should call the Prequalification Section of the Bureau of Construction at the number listed at the end of these instructions.

## **ADDENDA AND REVISIONS**

It is the bidder's responsibility to determine which, if any, addenda or revisions pertain to any project they may be bidding. Failure to incorporate all relevant addenda or revisions may cause the bid to be declared unacceptable.

Each addendum or revision will be included with the Electronic Plans and Proposals. Addenda and revisions will also be placed on the Addendum/Revision Checklist and each subscription service subscriber will be notified by e-mail of each addendum and revision issued.

The Internet is the Department's primary way of doing business. The subscription service emails are an added courtesy the Department provides. It is suggested that bidders check IDOT's website at <http://www.dot.il.gov/desenv/delett.html> before submitting final bid information.

***IDOT IS NOT RESPONSIBLE FOR ANY E-MAIL FAILURES.***

Addenda questions may be directed to the Contracts Office at (217)782-7806 or [DOT.D&Econtracts@illinois.gov](mailto:DOT.D&Econtracts@illinois.gov)

Technical questions about downloading these files may be directed to Tim Garman at (217)524-1642 or [Timothy.Garman@illinois.gov](mailto:Timothy.Garman@illinois.gov).

## **STANDARD GUIDELINES FOR SUBMITTING BIDS**

- All pages should be single sided.
- Use the Cover Page that is provided in the Bid Proposal (posted on the IDOT Web Site) as the first page of your submitted bid. It has the item number in large bold type in the upper left-hand corner and lines provided for your company name and address in the upper right-hand corner.
- Do not use report covers, presentation folders or special bindings and do not staple multiple times on left side like a book. Use only 1 staple in the upper left hand corner. Make sure all elements of your bid are stapled together including the bid bond or guaranty check (if required).
- Do not include any certificates of eligibility, your authorization to bid, Addendum Letters or affidavit of availability.
- Do not include the Subcontractor Documentation with your bid (pages i – iii and pages a – g). This documentation is required only if you are awarded the project.
- Use the envelope cover sheet (provided with the proposal) as the cover for the proposal envelope.
- Do not rely on overnight services to deliver your proposal prior to 10 AM on letting day. It will not be read if it is delivered after 10 AM.
- Do not submit your Substance Abuse Prevention Program (SAPP) with your bid. If you are awarded the contract this form is to be submitted to the district engineer at the pre-construction conference.

## **BID SUBMITTAL CHECKLIST**

- Cover page** (the sheet that has the item number on it) – This should be the first page of your bid proposal, **followed by your bid (the Schedule of Prices/Pay Items)**. If you are using special software or CBID to generate your schedule of prices, do not include the blank pages of the schedule of prices that came with the proposal package.
- Page 4 (Item 9)** – Check “YES” if you will use a subcontractor(s) with an annual value over \$50,000. Include the subcontractor(s) name, address, general type of work to be performed and the dollar amount. If you will use subcontractor(s) but are uncertain who or the dollar amount; check “YES” but leave the lines blank.
- After page 4** – Insert the following documents: The **Illinois Office Affidavit** (Not applicable to federally funded projects) followed by Cost Adjustments for Steel, Bituminous and Fuel (if applicable) and the Contractor Letter of Assent (if applicable). The general rule should be, if you don’t know where it goes, put it after page 4.
- Page 10 (Paragraph J)** – Check “YES” or “NO” whether your company has any business in Iran.
- Page 10 (Paragraph K)** – (Not applicable to federally funded projects) List the name of the apprenticeship and training program sponsor holding the certificate of registration from the US Department of Labor. If no applicable program exists, please indicate the work/job category **Your bid will not be read if this is not completed.** Do not include certificates with your bid. Keep the certificates in your office in case they are requested by IDOT.
- Page 11 (Paragraph L)** – A copy of your State Board of Elections certificate of registration is no longer required with your bid.
- Page 11 (Paragraph M)** – Indicate if your company has hired a lobbyist in connection with the job for which you are submitting the bid proposal.
- Page 12 (Paragraph C)** – This is a work sheet to determine if a completed Form A is required. It is not part of the form and you do not need to make copies for each completed Form A.
- Pages 14-17 (Form A)** – One Form A (4 pages) is required for each applicable person in your company. Copies of the forms can be used and only need to be changed when the information changes. The certification signature and date must be original for each letting. **Do not staple the forms together.** If you answered “NO” to all of the questions in Paragraph C (page 12), complete the first section (page 14) with your company information and then sign and date the Not Applicable statement on page 17.
- Page 18 (Form B)** - If you check “YES” to having other current or pending contracts it is acceptable to use the phrase, “See Affidavit of Availability on file”. **Ownership Certification** (at the bottom of the page) - Check N/A if the Form A(s) you submitted accounts for 100 percent of the company ownership. Check YES if any percentage of ownership falls outside of the parameters that require reporting on the Form A. Checking NO indicates that the Form A(s) you submitted is not correct and you will be required to submit a revised Form A.
- Page 20 (Workforce Projection)** – Be sure to include the Duration of the Project. It is acceptable to use the phrase “Per Contract Specifications”.

**Proposal Bid Bond** – (Insert after the proposal signature page) Submit your proposal Proposal Bid Bond (if applicable) using the current Proposal Bid Bond form provided in the proposal package. The Power of Attorney page should be stapled to the Proposal Bid Bond. If you are using an electronic bond, include your bid bond number on the Proposal Bid Bond and attach the Proof of Insurance printed from the Surety’s Web Site.

**Disadvantaged Business Utilization Plan and/or Good Faith Effort** – The last items in your bid should be the DBE Utilization Plan (SBE 2026), followed by the DBE Participation Statement (SBE 2025) and supporting paperwork. If you have documentation of a Good Faith Effort, it is to follow the SBE Forms.

**The Bid Letting is now available in streaming Audio/Video from the IDOT Web Site.** A link to the stream will be placed on the main page of the current letting on the day of the Letting. The stream will not begin until 10 AM. The actual reading of the bids does not begin until approximately 10:30 AM.

Following the Letting, the As-Read Tabulation of Bids will be posted by the end of the day. You will find the link on the main Web page for the current letting.

**QUESTIONS: pre-letting up to execution of the contract**

Contractor pre-qualification .....	217-782-3413
Small Business, Disadvantaged Business Enterprise (DBE) .....	217-785-4611
Contracts, Bids, Letting process or Internet downloads .....	217-782-7806
Estimates Unit.....	217-785-3483
Aeronautics.....	217-785-8515
IDNR (Land Reclamation, Water Resources, Natural Resources).....	217-782-6302

**QUESTIONS: following contract execution**

Subcontractor documentation, payments .....	217-782-3413
Railroad Insurance .....	217-785-0275

# 72

RETURN WITH BID

Proposal Submitted By
Name
Address
City

## Letting November 8, 2013

### NOTICE TO PROSPECTIVE BIDDERS

This proposal can be used for bidding purposes by only those companies that request and receive written AUTHORIZATION TO BID from IDOT's Central Bureau of Construction.

**BIDDERS NEED NOT RETURN THE ENTIRE PROPOSAL**

# Notice to Bidders, Specifications, Proposal, Contract and Contract Bond



**Illinois Department  
of Transportation**

Springfield, Illinois 62764

**Contract No. 60W26  
COOK County  
Section 2013-008R  
Route FAI 90/94/290  
Project ACNHPP-000S(947)  
District 1 Construction Funds**

PLEASE MARK THE APPROPRIATE BOX BELOW:

- A Bid Bond is included.
- A Cashier's Check or a Certified Check is included

Prepared by

F

Checked by

(Printed by authority of the State of Illinois)

**Page intentionally left blank**

RETURN WITH BID



PROPOSAL

TO THE DEPARTMENT OF TRANSPORTATION

1. Proposal of \_\_\_\_\_  
\_\_\_\_\_

Taxpayer Identification Number (Mandatory) \_\_\_\_\_

For the improvement identified and advertised for bids in the Invitation for Bids as:

**Contract No. 60W26  
COOK County  
Section 2013-008R  
Project ACNHPP-000S(947)  
Route FAI 90/94/290  
District 1 Construction Funds**

**Bridge removal and replacement, approach roadway construction and resurfacing underpass and roadway lighting on the Halsted St. and West Harrison Bridges canopy construction on Halsted St. near CTA station and new traffic signals, all located along I-90/24/290 from Circle Interchanges to Halston St. Bridge and Harrison St. Bridge in Chicago.**

2. The undersigned bidder will furnish all labor, material and equipment to complete the above described project in a good and workmanlike manner as provided in the contract documents provided by the Department of Transportation. This proposal will become part of the contract and the terms and conditions contained in the contract documents will govern performance and payments.

**RETURN WITH BID**

3. **ASSURANCE OF EXAMINATION AND INSPECTION/WAIVER.** The undersigned bidder further declares that he/she has carefully examined the proposal, plans, specifications, addenda form of contract and contract bond, and special provisions, and that he/she has inspected in detail the site of the proposed work, and that he/she has familiarized themselves with all of the local conditions affecting the contract and the detailed requirements of construction, and understands that in making this bid proposal he/she waives all right to plead any misunderstanding regarding the same.
  
4. **EXECUTION OF CONTRACT AND CONTRACT BOND.** The undersigned bidder further agrees to execute a contract for this work and present the same to the department within fifteen (15) days after the contract has been mailed to him/her. The undersigned further agrees that he/she and his/her surety will execute and present within fifteen (15) days after the contract has been mailed to him/her contract bond satisfactory to and in the form prescribed by the Department of Transportation, in the penal sum of the full amount of the contract, or as specified in the special provisions, guaranteeing the faithful performance of the work in accordance with the terms of the contract.
  
5. **PROPOSAL GUARANTY.** Accompanying this proposal is either a bid bond on the department form, executed by a corporate surety company satisfactory to the department, or a proposal guaranty check consisting of a bank cashier's check or a properly certified check for not less than 5 per cent of the amount bid or for the amount specified in the following schedule:

<u>Amount of Bid</u>		<u>Proposal Guaranty</u>	<u>Amount of Bid</u>		<u>Proposal Guaranty</u>	
Up to	\$5,000 .....	\$150	\$2,000,000	to	\$3,000,000 .....	\$100,000
\$5,000	to	\$300	\$3,000,000	to	\$5,000,000 .....	\$150,000
\$10,000	to	\$1,000	\$5,000,000	to	\$7,500,000 .....	\$250,000
\$50,000	to	\$3,000	\$7,500,000	to	\$10,000,000 .....	\$400,000
\$100,000	to	\$5,000	\$10,000,000	to	\$15,000,000 .....	\$500,000
\$150,000	to	\$7,500	\$15,000,000	to	\$20,000,000 .....	\$600,000
\$250,000	to	\$12,500	\$20,000,000	to	\$25,000,000 .....	\$700,000
\$500,000	to	\$25,000	\$25,000,000	to	\$30,000,000 .....	\$800,000
\$1,000,000	to	\$50,000	\$30,000,000	to	\$35,000,000 .....	\$900,000
\$1,500,000	to	\$75,000	over		\$35,000,000 .....	\$1,000,000

Bank cashier's checks or properly certified checks accompanying bid proposals will be made payable to the Treasurer, State of Illinois.

If a combination bid is submitted, the proposal guaranties which accompany the individual bid proposals making up the combination will be considered as also covering the combination bid.

The amount of the proposal guaranty check is \_\_\_\_\_ \$( \_\_\_\_\_ ). If this proposal is accepted and the undersigned will fail to execute a contract bond as required herein, it is hereby agreed that the amount of the proposal guaranty will become the property of the State of Illinois, and shall be considered as payment of damages due to delay and other causes suffered by the State because of the failure to execute said contract and contract bond; otherwise, the bid bond will become void or the proposal guaranty check will be returned to the undersigned.

**Attach Cashier's Check or Certified Check Here**

In the event that one proposal guaranty check is intended to cover two or more bid proposals, the amount must be equal to the sum of the proposal guaranties which would be required for each individual bid proposal. If the guaranty check is placed in another bid proposal, state below where it may be found.

The proposal guaranty check will be found in the bid proposal for:

Item \_\_\_\_\_

Section No. \_\_\_\_\_

County \_\_\_\_\_

**Mark the proposal cover sheet as to the type of proposal guaranty submitted.**

**RETURN WITH BID**

6. **COMBINATION BIDS.** The undersigned bidder further agrees that if awarded the contract for the sections contained in the following combination, he/she will perform the work in accordance with the requirements of each individual contract comprising the combination bid specified in the schedule below, and that the combination bid shall be prorated against each section in proportion to the bid submitted for the same. If an error is found to exist in the gross sum bid for one or more of the individual sections included in a combination, the combination bid shall be corrected as provided in the specifications.

**When a combination bid is submitted, the schedule below must be completed in each proposal comprising the combination.**

**If alternate bids are submitted for one or more of the sections comprising the combination, a combination bid must be submitted for each alternate.**

**Schedule of Combination Bids**

Combination No.	Sections Included in Combination	Combination Bid	
		Dollars	Cents

7. **SCHEDULE OF PRICES.** The undersigned bidder submits herewith, in accordance with the rules and instructions, a schedule of prices for the items of work for which bids are sought. The unit prices bid are in U.S. dollars and cents, and all extensions and summations have been made. The bidder understands that the quantities appearing in the bid schedule are approximate and are provided for the purpose of obtaining a gross sum for the comparison of bids. If there is an error in the extension of the unit prices, the unit prices will govern. Payment to the contractor awarded the contract will be made only for actual quantities of work performed and accepted or materials furnished according to the contract. The scheduled quantities of work to be done and materials to be furnished may be increased, decreased or omitted as provided elsewhere in the contract.
8. **AUTHORITY TO DO BUSINESS IN ILLINOIS.** Section 20-43 of the Illinois Procurement Code (the Code) (30 ILCS 500/20-43) provides that a person (other than an individual acting as a sole proprietor) must be a legal entity authorized to do business in the State of Illinois prior to submitting the bid.
9. **EXECUTION OF CONTRACT:** The Department of Transportation will, in accordance with the rules governing Department procurements, execute the contract and shall be the sole entity having the authority to accept performance and make payments under the contract. Execution of the contract by the Chief Procurement Officer (CPO) or the State Purchasing Officer (SPO) is for approval of the procurement process and execution of the contract by the Department. Neither the CPO nor the SPO shall be responsible for administration of the contract or determinations respecting performance or payment there under except as otherwise permitted in the Code.
10. **The services of a subcontractor will be used.**

Check box Yes   
 Check box No

For known subcontractors with subcontracts with an annual value of more than \$50,000, the contract shall include their name, address, general type of work to be performed, and the dollar allocation for each subcontractor.  
 (30 ILCS 500/20-120)

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ILLINOIS DEPARTMENT OF TRANSPORTATION  
 SCHEDULE OF PRICES  
 CONTRACT  
 NUMBER -

60W26

State Job # - C-91-228-13

County Name - COOK - -

Code - 31 - -

District - 1 - -

Section Number - 2013-008R

Project Number  
 ACNHPP-000S/947/

Route  
 FAI 90  
 FAI 94  
 FAI 290

Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
X0300249	REMOV EX GATE	EACH	1.000				
X0322024	TRENCH DRAIN	EACH	1.000				
X0322400	PILE EXTRACTION	EACH	133.000				
X0322446	CAB HOUSING EQU TY 3	EACH	2.000				
X0322587	CONSTRUCTION ACCESS	EACH	1.000				
X0322689	P S AB 10 7G 34'-6"	EACH	4.000				
X0322690	P S AB 10 3G 34'-6"	EACH	2.000				
X0323553	ORN FENCE WRT IRON	FOOT	118.000				
X0324198	REMOV ASB CEM CONDUIT	FOOT	5,280.000				
X0324345	COMB SEW REM 24	FOOT	87.000				
X0324571	MAINT ST LTG SYS CHGO	L SUM	1.000				
X0325003	REM EX VALVE & VAULT	EACH	11.000				
X0325207	TV INSPECT OF SEWER	FOOT	2,256.000				
X0325279	CLASS SI CONC (MISC)	CU YD	168.000				
X0325349	TEMP CON BAR (PERM)	FOOT	200.000				

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X0325476	RADAR VEH DETECT SYST	EACH	6.000				
X0326326	CC TPX 2-1/C6 1-1/CG	FOOT	3,720.000				
X0326382	CONC BARRIER BASE SPL	FOOT	553.000				
X0326486	DECORATIVE RAIL PR MT	FOOT	1,600.000				
X0326801	COMBND SEWR TO BE CLN	FOOT	404.000				
X0326935	CROSSHOLE SONIC LOG	EACH	11.000				
X0326968	JUN BOX POLE/POST MTD	EACH	8.000				
X0327004	TEMP WP 60 CL 4	EACH	6.000				
X0327357	CONSTRN VBRN MONITRNG	L SUM	1.000				
X0327371	PLUG EXISTING PIPE	CU YD	0.500				
X0327391	WOOD POLE 45 CL 5	EACH	13.000				
X0327615	COMB SEW REM 8	FOOT	278.000				
X0327616	MAINT ITS DURG CONSTR	CAL MO	12.000				
X0327644	TEMP BRIDGE	L SUM	1.000				
X0327645	TEMP SOIL RET SYS SPL	SQ FT	303.000				

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 ACNHPP-000S/947/

Route  
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 FAI 94  
 FAI 290

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X0327646	REMOVE GATE POSTS	EACH	3.000				
X0327647	REM EX VALV VAULT SPL	EACH	1.000				
X0327648	COMB SEW REM 60	FOOT	202.000				
X0327649	SOIL RETENTION SYSTEM	SQ FT	4,403.000				
X0327650	TEMP DRAINAGE SYS N1	L SUM	1.000				
X0370013	CON FDN TPBM TSC CDOT	EACH	2.000				
X0370015	CF30 1.50A16.50B CDOT	EACH	2.000				
X0370017	DRILL HNDHL/MNHL CHGO	EACH	47.000				
X0370018	ELCBL C #14 19C CDOT	FOOT	1,447.000				
X0370021	EL HH 30 24 F&L CDOT	EACH	1.000				
X0370022	EL HHD 36 24F&L CDOT	EACH	2.000				
X0370023	EL MH 3X4X4 24FL CDOT	EACH	6.000				
X0370028	HRNS CBL 16 8/C CDOT	FOOT	643.000				
X0370031	PS AB12.5 3G34.5 CDOT	EACH	2.000				
X0370047	INST LP MA & LUM CHGO	EACH	22.000				

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X0370049	UGRD C PVC2SCH80 CDOT	FOOT	945.000				
X0370050	ATC TRAF 16LB PC CDOT	EACH	2.000				
X0370052	ELCBL C # 4 2C CDOT	FOOT	272.000				
X0370058	MA STL MONO 26 CDOT	EACH	2.000				
X0370060	MA STL MONO 35 CDOT	EACH	2.000				
X0370063	SERV INST 100AMP CDOT	EACH	1.000				
X0370064	UGRD C PVC3SCH80 CDOT	FOOT	1,038.000				
X0370068	CF24 1.25A15B CDOT	EACH	2.000				
X0370069	COMB SEW ESVCP 8 CDOT	FOOT	303.000				
X0370070	COMB SEW WMR 8 CDOT	FOOT	83.000				
X0370073	REM/REIN MST/LUM CDOT	EACH	8.000				
X0370075	UGRD C PVC4SCH80 CDOT	FOOT	3,340.000				
X0370076	ROD/CL DCT COND CDOT	FOOT	94.000				
X0370077	LOCATE TUNNEL CHICAGO	EACH	4.000				
X0370078	BULKHD TUNNEL CHICAGO	EACH	1.000				

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X0370080	COMB C&G B V.12(CDOT)	FOOT	856.500				
X0370081	SAND CUSHION 4 (CDOT)	SQ FT	8,984.000				
X0370114	RACKING CBLs MH OR HH	EACH	10.000				
X0370135	CONC CURB TB SPL CDOT	FOOT	86.000				
X0370162	WM RELOCATION 54 CDWM	L SUM	1.000				
X0370163	CB A 4D T1F CL CHGO	EACH	1.000				
X0370164	MAN TA 4D T1F CL CHGO	EACH	3.000				
X0370165	RC PIPE ELBOW 60 CDWM	EACH	3.000				
X0370166	PREC TUMBL BASIN CDWM	EACH	1.000				
X0370167	SS T4 12 ESVCP CDOT	FOOT	42.000				
X0370168	COMB SEW A T3 60 CDWM	FOOT	180.000				
X0370169	TRANS CANOPY ROOF CTA	SQ FT	1,662.000				
X0370170	ELECT WORK CANOPY CTA	L SUM	1.000				
X0370171	FLASH GUT SH MET CTA	L SUM	1.000				
X0370172	LED LIGHT FIXTURE CTA	EACH	36.000				

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X0370173	PLUMBG DOWNSPOUTS CTA	L SUM	1.000				
X0370174	STRUCTURAL STEEL CTA	L SUM	1.000				
X0370175	CF28 1.25A15B CDOT	EACH	5.000				
X0370176	CF24 1.25A15B 9' CDOT	EACH	2.000				
X0370177	CF24 1.25A15B 7' CDOT	EACH	4.000				
X0370178	WIRELESS DET PKG CDOT	EACH	2.000				
X0370179	FM WIRELESS SENS CDOT	EACH	15.000				
X0370180	C5 CBL WIREL DET CDOT	FOOT	811.000				
X0370181	CONNECTORS C5CBL CDOT	EACH	5.000				
X0370182	ELCBL #12 2/C SH CDOT	FOOT	799.000				
X0370183	SH P LED 1F3S SM CDOT	EACH	6.000				
X0370184	PED SHPLED1FSMCT CDOT	EACH	2.000				
X2090215	SELECT GRAN BACK SPEC	CU YD	120.000				
X2130010	EXPLOR TRENCH SPL	FOOT	100.000				
X4240800	DETECTABLE WARN SPL	SQ FT	160.000				

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X5012502	CONC REM SPEC	CU YD	65.000				
X5091730	BRIDGE FENCE RAIL SP	FOOT	145.000				
X5537700	SS CLEANED 10	FOOT	175.000				
X5537800	SS CLEANED 12	FOOT	353.000				
X5538100	SS CLEANED 21	FOOT	35.000				
X5610651	ABAN EX WM FILL CLSM	FOOT	280.000				
X5610708	WATER MAIN REMOV 8	FOOT	25.000				
X5610712	WATER MAIN REMOV 12	FOOT	65.000				
X5610724	WATER MAIN REMOV 24	FOOT	32.000				
X5610736	WATER MAIN REMOV 36	FOOT	82.000				
X5610739	WATER MAIN REMOV 48	FOOT	166.000				
X5610741	WATER MAIN REMOV 54	FOOT	145.000				
X5860110	GRANULAR BACKFILL STR	CU YD	1,006.000				
X6011705	PIPE DRAINS 6 SPL	FOOT	18.000				
X6020083	INLET TA T1FOL (CHGO)	EACH	3.000				

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X6020270	MAN TB 4D T1F CL CHGO	EACH	1.000				
X6022505	CB TA 4D T1FOL (CHGO)	EACH	7.000				
X6022712	CB TA 4 DIA W/SPL F&G	EACH	2.000				
X6022900	CB RECONST SPL	EACH	4.000				
X6023212	INLETS TA SPL F&G SPL	EACH	2.000				
X6028000	MAN RECONST SPL	EACH	3.000				
X6030310	FR & LIDS ADJUST SPL	EACH	21.000				
X6060714	CONC MEDIAN SPL	SQ FT	252.000				
X6331110	STEEL POSTS SPECIAL	EACH	4.000				
X6370050	CONC BAR WALL SPL	FOOT	448.000				
X6370700	CONC BAR TRANS SPL	FOOT	105.000				
X6430120	REM IMP ATTEN NO SALV	EACH	1.000				
X6700410	ENGR FLD OFF A SPL	CAL MO	12.000				
X7010216	TRAF CONT & PROT SPL	L SUM	1.000				
X7011015	TR C-PROT EXPRESSWAYS	L SUM	1.000				



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X7013820	TR CONT SURVEIL EXPWY	CAL DA	115.000				
X7035100	TEMP EPOXY PVT MK L&S	SQ FT	200.000				
X7035104	TEMP EPOXY PVT MK L4	FOOT	51,433.000				
X7035105	TEMP EPOXY PVT MK L5	FOOT	5,982.000				
X7035106	TEMP EPOXY PVT MK L6	FOOT	3,000.000				
X7035108	TEMP EPOXY PVT MK L8	FOOT	7,592.000				
X7035112	TEMP EPOXY PVT MK L12	FOOT	2,204.000				
X7035124	TEMP EPOXY PVT MK L24	FOOT	200.000				
X7040010	TEMP CONC BARRIER SPL	FOOT	737.500				
X7200105	SIGN PANEL T1 SPL	SQ FT	46.000				
X7360300	REM OH SIN STR-WLKWAY	FOOT	69.000				
X8510250	PT EX POLE/POST/CONTR	EACH	7.000				
X8730465	ELCBL AS COMM 19 100P	FOOT	5,000.000				
X8800101	PED PUSH-BUTTON SPL	EACH	2.000				
X8950425	REMOV TRAF SURV EQUIP	L SUM	1.000				

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Z0004552	APPROACH SLAB REM	SQ YD	1,203.000				
Z0012754	STR REP CON DP = < 5	SQ FT	154.000				
Z0013798	CONSTRUCTION LAYOUT	L SUM	1.000				
Z0018002	DRAINAGE SCUPPR DS-11	EACH	2.000				
Z0018800	DRAINAGE SYSTEM	L SUM	1.000				
Z0022800	FENCE REMOVAL	FOOT	392.000				
Z0030850	TEMP INFO SIGNING	SQ FT	109.000				
Z0033028	MAINTAIN LIGHTING SYS	CAL MO	12.000				
Z0046304	P UNDR FOR STRUCT 4	FOOT	678.000				
Z0048665	RR PROT LIABILITY INS	L SUM	1.000				
Z0056608	STORM SEW WM REQ 12	FOOT	57.000				
Z0062456	TEMP PAVEMENT	SQ YD	3,080.000				
Z0073002	TEMP SOIL RETEN SYSTM	SQ FT	17,962.000				
Z0073100	TEMP SHORING	EACH	3.000				
Z0076600	TRAINEES	HOUR	1,500.000		0.800		
Z0076604	TRAINEES TPG	HOUR	1,500.000		10.000		
20100110	TREE REMOV 6-15	UNIT	522.000				

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20100210	TREE REMOV OVER 15	UNIT	82.000				
20100500	TREE REMOV ACRES	ACRE	0.500				
20101100	TREE TRUNK PROTECTION	EACH	11.000				
20101200	TREE ROOT PRUNING	EACH	11.000				
20101300	TREE PRUN 1-10	EACH	5.000				
20101350	TREE PRUN OVER 10	EACH	6.000				
20200100	EARTH EXCAVATION	CU YD	10,795.000				
20201200	REM & DISP UNS MATL	CU YD	1,800.000				
20400800	FURNISHED EXCAVATION	CU YD	2,675.000				
20800150	TRENCH BACKFILL	CU YD	1,612.000				
21001000	GEOTECH FAB F/GR STAB	SQ YD	3,777.000				
21101615	TOPSOIL F & P 4	SQ YD	9,078.000				
25000210	SEEDING CL 2A	ACRE	1.250				
25000400	NITROGEN FERT NUTR	POUND	272.000				
25000600	POTASSIUM FERT NUTR	POUND	272.000				

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25000750	MOWING	ACRE	1.250				
25100115	MULCH METHOD 2	ACRE	3.250				
25100135	MULCH METHOD 4	ACRE	4.500				
25100630	EROSION CONTR BLANKET	SQ YD	6,030.000				
25200110	SODDING SALT TOLERANT	SQ YD	2,048.000				
25200200	SUPPLE WATERING	UNIT	20.500				
28000250	TEMP EROS CONTR SEED	POUND	610.000				
28000400	PERIMETER EROS BAR	FOOT	10,038.000				
28000510	INLET FILTERS	EACH	96.000				
30300001	AGG SUBGRADE IMPROVE	CU YD	175.000				
31101200	SUB GRAN MAT B 4	SQ YD	3,330.000				
31101400	SUB GRAN MAT B 6	SQ YD	3,605.000				
35300400	PCC BSE CSE 9	SQ YD	2,991.000				
35301200	HES PCC BSE CSE 9	SQ YD	305.000				
40201000	AGGREGATE-TEMP ACCESS	TON	250.000				

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40600200	BIT MATLS PR CT	TON	1.500				
40600300	AGG PR CT	TON	8.000				
40600982	HMA SURF REM BUTT JT	SQ YD	197.000				
40603085	HMA BC IL-19.0 N70	TON	416.000				
40603340	HMA SC "D" N70	TON	339.000				
42001200	PAVEMENT FABRIC	SQ YD	3,296.000				
42001300	PROTECTIVE COAT	SQ YD	1,827.000				
42001430	BR APPR PVT CON (FLX)	SQ YD	110.000				
42300400	PCC DRIVEWAY PAVT 8	SQ YD	141.000				
42400200	PC CONC SIDEWALK 5	SQ FT	7,150.500				
42400410	PC CONC SIDEWALK 8	SQ FT	1,832.500				
44000100	PAVEMENT REM	SQ YD	5,661.000				
44000156	HMA SURF REM 1 3/4	SQ YD	55.000				
44000200	DRIVE PAVEMENT REM	SQ YD	140.000				
44000300	CURB REM	FOOT	74.000				

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44000400	GUTTER REM	FOOT	392.000				
44000500	COMB CURB GUTTER REM	FOOT	1,393.000				
44000600	SIDEWALK REM	SQ FT	9,293.000				
44001980	CONC BARRIER REMOV	FOOT	1,685.000				
44003100	MEDIAN REMOVAL	SQ FT	430.000				
44004250	PAVED SHLD REMOVAL	SQ YD	1,218.000				
50100300	REM EXIST STRUCT N1	EACH	1.000				
50100400	REM EXIST STRUCT N2	EACH	1.000				
50157300	PROTECTIVE SHIELD	SQ YD	4,909.000				
50200100	STRUCTURE EXCAVATION	CU YD	5,695.000				
50300225	CONC STRUCT	CU YD	2,766.900				
50300255	CONC SUP-STR	CU YD	2,811.800				
50300260	BR DECK GROOVING	SQ YD	5,122.000				
50300285	FORM LINER TEX SURF	SQ FT	4,224.000				
50300300	PROTECTIVE COAT	SQ YD	8,251.000				

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50500105	F & E STRUCT STEEL	L SUM	1.000				
50500505	STUD SHEAR CONNECTORS	EACH	38,001.000				
50800105	REINFORCEMENT BARS	POUND	2,083,540.000				
50800205	REINF BARS, EPOXY CTD	POUND	1,242,130.000				
50800515	BAR SPLICERS	EACH	2,275.000				
50800530	MECHANICAL SPLICERS	EACH	2,672.000				
51100100	SLOPE WALL 4	SQ YD	50.000				
51500100	NAME PLATES	EACH	3.000				
51602000	PERMANENT CASING	FOOT	1,633.000				
51603000	DRILLED SHAFT IN SOIL	CU YD	6,112.700				
51604000	DRILLED SHAFT IN ROCK	CU YD	76.500				
52000110	PREF JT STRIP SEAL	FOOT	356.000				
52100010	ELAST BEARING ASSY T1	EACH	54.000				
52100020	ELAST BEARING ASSY T2	EACH	45.000				
52100505	ANCHOR BOLTS 5/8	EACH	30.000				

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52100520	ANCHOR BOLTS 1	EACH	90.000				
52100530	ANCHOR BOLTS 1 1/4	EACH	138.000				
52100540	ANCHOR BOLTS 1 1/2	EACH	24.000				
550A0050	STORM SEW CL A 1 12	FOOT	61.000				
550A0120	STORM SEW CL A 1 24	FOOT	77.000				
550A0340	STORM SEW CL A 2 12	FOOT	53.000				
550A0940	STORM SEW CL A 4 12	FOOT	33.000				
55100400	STORM SEWER REM 10	FOOT	38.000				
55100500	STORM SEWER REM 12	FOOT	173.000				
55101100	STORM SEWER REM 21	FOOT	90.000				
56400500	FIRE HYDNITS TO BE REM	EACH	3.000				
58700300	CONCRETE SEALER	SQ FT	37,786.000				
59000200	EPOXY CRACK INJECTION	FOOT	14.000				
59100100	GEOCOMPOSITE WALL DR	SQ YD	531.000				
59300100	CONTR LOW-STRENG MATL	CU YD	845.000				



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60107700	PIPE UNDERDRAINS 6	FOOT	37.000				
60108200	PIPE UNDERDRAIN 6 SP	FOOT	6.000				
60200105	CB TA 4 DIA T1F OL	EACH	2.000				
60201310	CB TA 4 DIA T20F&G	EACH	2.000				
60203905	CB TA 5 DIA T1F CL	EACH	1.000				
60221100	MAN TA 5 DIA T1F CL	EACH	2.000				
60234200	INLETS TA T1F OL	EACH	1.000				
60236200	INLETS TA T8G	EACH	1.000				
60237420	INLETS TA T20F&G	EACH	2.000				
60250200	CB ADJUST	EACH	5.000				
60255500	MAN ADJUST	EACH	10.000				
60257900	MAN RECONST	EACH	1.000				
60260100	INLETS ADJUST	EACH	7.000				
60500040	REMOV MANHOLES	EACH	5.000				
60500050	REMOV CATCH BAS	EACH	9.000				

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60500060	REMOV INLETS	EACH	12.000				
60500405	FILL VALVE VLTS	EACH	2.000				
60605000	COMB CC&G TB6.24	FOOT	273.000				
60618300	CONC MEDIAN SURF 4	SQ FT	770.000				
63700175	CONC BAR 1F 42HT	FOOT	530.000				
63700805	CONC BAR TRANS	FOOT	210.000				
63700900	CONC BARRIER BASE	FOOT	740.000				
64300900	IMP ATTEN SU WID TL2	EACH	2.000				
66400105	CH LK FENCE 4	FOOT	230.000				
66400305	CH LK FENCE 6	FOOT	117.000				
66400505	CH LK FENCE 8	FOOT	14.000				
66405500	CH LK GATE 8X12 SINGL	EACH	1.000				
66407400	CH LK GATES 6X8 DBL	EACH	1.000				
67100100	MOBILIZATION	L SUM	1.000				
70103815	TR CONT SURVEILLANCE	CAL DA	115.000				

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70300100	SHORT TERM PAVT MKING	FOOT	81,616.000				
70301000	WORK ZONE PAVT MK REM	SQ FT	16,603.000				
70400100	TEMP CONC BARRIER	FOOT	6,213.000				
70400200	REL TEMP CONC BARRIER	FOOT	6,662.500				
70600255	IMP ATTN TEMP FRN TL2	EACH	1.000				
70600260	IMP ATTN TEMP FRN TL3	EACH	14.000				
70600322	IMP ATTN REL FRN TL2	EACH	2.000				
70600332	IMP ATTN REL FRN TL3	EACH	14.000				
72000100	SIGN PANEL T1	SQ FT	59.000				
72000200	SIGN PANEL T2	SQ FT	84.000				
72000300	SIGN PANEL T3	SQ FT	674.500				
72400100	REMOV SIN PAN ASSY TA	EACH	1.000				
72400310	REMOV SIGN PANEL T1	SQ FT	85.000				
72400320	REMOV SIGN PANEL T2	SQ FT	82.000				
72400330	REMOV SIGN PANEL T3	SQ FT	108.000				

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72400730	RELOC SIGN PANEL T3	SQ FT	290.000				
72700100	STR STL SIN SUP BA	POUND	1,892.000				
72800100	TELES STL SIN SUPPORT	FOOT	151.000				
73000100	WOOD SIN SUPPORT	FOOT	36.000				
73300100	OVHD SIN STR-SPAN T1A	FOOT	68.000				
73400100	CONC FOUNDATION	CU YD	5.100				
73400200	DRILL SHAFT CONC FDN	CU YD	22.700				
73600100	REMOV OH SIN STR-SPAN	EACH	1.000				
73700100	REM GR MT SIN SUPPORT	EACH	5.000				
73700200	REM CONC FDN-GR MT	EACH	2.000				
73700300	REM CONC FDN-OVHD	EACH	2.000				
78000100	THPL PVT MK LTR & SYM	SQ FT	354.000				
78000200	THPL PVT MK LINE 4	FOOT	2,855.000				
78000400	THPL PVT MK LINE 6	FOOT	2,452.000				
78000600	THPL PVT MK LINE 12	FOOT	101.000				

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78000650	THPL PVT MK LINE 24	FOOT	704.000				
78005110	EPOXY PVT MK LINE 4	FOOT	10,175.000				
78005120	EPOXY PVT MK LINE 5	FOOT	2,244.000				
78005140	EPOXY PVT MK LINE 8	FOOT	1,434.000				
78005150	EPOXY PVT MK LINE 12	FOOT	676.000				
78006100	PREF THPL PM LTR-SYM	SQ FT	303.000				
78008200	POLYUREA PM T1 LTR-SY	SQ FT	62.000				
78008210	POLYUREA PM T1 LN 4	FOOT	1,825.000				
78008230	POLYUREA PM T1 LN 6	FOOT	2,602.000				
78008250	POLYUREA PM T1 LN 12	FOOT	34.000				
78008270	POLYUREA PM T1 LN 24	FOOT	155.000				
78100100	RAISED REFL PAVT MKR	EACH	238.000				
78200530	BAR WALL MKR TYPE C	EACH	89.000				
78300100	PAVT MARKING REMOVAL	SQ FT	12,593.000				
78300200	RAISED REF PVT MK REM	EACH	230.000				

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80400100	ELECT SERV INSTALL	EACH	1.000				
80400200	ELECT UTIL SERV CONN	L SUM	1.000		15,000.000		15,000.000
81028200	UNDRGRD C GALVS 2	FOOT	383.000				
81028220	UNDRGRD C GALVS 3	FOOT	480.000				
81028350	UNDRGRD C PVC 2	FOOT	1,075.000				
81028370	UNDRGRD C PVC 3	FOOT	591.000				
81100300	CON AT ST 1 GALVS	FOOT	113.000				
81100320	CON AT ST 1 PVC GS	FOOT	2,420.000				
81100600	CON AT ST 2 GALVS	FOOT	70.000				
81100605	CON AT ST 2 PVC GALVS	FOOT	1,768.000				
81100805	CON AT ST 3 PVC GALVS	FOOT	550.000				
81101005	CON AT ST 4 PVC GALVS	FOOT	7,040.000				
81200230	CON EMB STR 2 PVC	FOOT	3,005.000				
81200270	CON EMB STR 4 PVC	FOOT	205.000				
81300100	JUN BX SS AS 4X4X3	EACH	6.000				

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81300220	JUN BX SS AS 6X6X4	EACH	28.000				
81300310	JUN BX SS AS 8X6X4	EACH	3.000				
81300410	JUN BX SS AS 10X8X4	EACH	4.000				
81300530	JUN BX SS AS 12X10X6	EACH	24.000				
81300830	JUN BX SS AS 18X18X8	EACH	16.000				
81400200	HD HANDHOLE	EACH	2.000				
81603081	UD 3#2#4GXLP USE 1.5 P	FOOT	1,165.000				
81702110	EC C XLP USE 1C 10	FOOT	7,700.000				
81702140	EC C XLP USE 1C 4	FOOT	670.000				
81702400	EC C XLP USE 3-1C 2	FOOT	220.000				
81702460	EC C XLP USE 3-1C 3/0	FOOT	450.000				
81800150	A CBL 3-1C3/0 MES W	FOOT	150.000				
81800330	A CBL 3-1C6 MESS WIRE	FOOT	450.000				
82107100	UNDERPAS LUM 70W HPS	EACH	6.000				
82107200	UNDERPAS LUM 100W HPS	EACH	34.000				

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84200500	REM LT UNIT SALV	EACH	68.000				
84200804	REM POLE FDN	EACH	9.000				
84500120	REMOV ELECT SERV INST	EACH	1.000				
85000200	MAIN EX TR SIG INSTAL	EACH	1.000				
87602000	PED PUSHBUTTON POST	EACH	2.000				
87800200	CONC FDN TY D	FOOT	7.000				
87900200	DRILL EX HANDHOLE	EACH	2.000				
88040070	SH P LED 1F 3S BM	EACH	6.000				
88040090	SH P LED 1F 3S MAM	EACH	8.000				
88040150	SH P LED 1F 5S BM	EACH	5.000				
88040160	SH P LED 1F 5S MAM	EACH	5.000				
88102825	PED SH P LED 1F BM CT	EACH	16.000				
89000100	TEMP TR SIG INSTALL	EACH	1.000				
89502375	REMOV EX TS EQUIP	EACH	2.000				
89502380	REMOV EX HANDHOLE	EACH	14.000				





**CONTRACT NUMBER**

**60W26**

**THIS IS THE TOTAL BID**

**\$ \_\_\_\_\_**

**NOTES:**

- 1. Each PAY ITEM should have a UNIT PRICE and a TOTAL PRICE.**
- 2. The UNIT PRICE shall govern if no TOTAL PRICE is shown or if there is a discrepancy between the product of the UNIT PRICE multiplied by the QUANTITY.**
- 3. If a UNIT PRICE is omitted, the TOTAL PRICE will be divided by the QUANTITY in order to establish a UNIT PRICE.**
- 4. A bid may be declared UNACCEPTABLE if neither a unit price nor a total price is shown.**

## RETURN WITH BID

### **STATE REQUIRED ETHICAL STANDARDS GOVERNING CONTRACT PROCUREMENT: ASSURANCES, CERTIFICATIONS AND DISCLOSURES**

#### I. GENERAL

A. Article 50 of the Code establishes the duty of all State CPOs, SPOs, and their designees to maximize the value of the expenditure of public moneys in procuring goods, services, and contracts for the State of Illinois and to act in a manner that maintains the integrity and public trust of State government. In discharging this duty, they are charged by law to use all available information, reasonable efforts, and reasonable actions to protect, safeguard, and maintain the procurement process of the State of Illinois.

B. In order to comply with the provisions of Article 50 and to carry out the duty established therein, all bidders are to adhere to ethical standards established for the procurement process, and to make such assurances, disclosures and certifications required by law. Except as otherwise required in subsection III, paragraphs J-M, by execution of the Proposal Signature Sheet, the bidder indicates that each of the mandated assurances have been read and understood, that each certification is made and understood, and that each disclosure requirement has been understood and completed.

C. In addition to all other remedies provided by law, failure to comply with any assurance, failure to make any disclosure or the making of a false certification shall be grounds for the CPO to void the contract, and may result in the suspension or debarment of the bidder or subcontractor. If a false certification is made by a subcontractor the contractor's submitted bid and the executed contract may not be declared void unless the contractor refuses to terminate the subcontract upon the State's request after a finding that the subcontractor's certification was false.

I acknowledge, understand and accept these terms and conditions.

#### II. ASSURANCES

The assurances hereinafter made by the bidder are each a material representation of fact upon which reliance is placed should the Department enter into the contract with the bidder.

##### A. Conflicts of Interest

Section 50-13. Conflicts of Interest.

(a) Prohibition. It is unlawful for any person holding an elective office in this State, holding a seat in the General Assembly, or appointed to or employed in any of the offices or agencies of state government and who receives compensation for such employment in excess of 60% of the salary of the Governor of the State of Illinois, or who is an officer or employee of the Capital Development Board or the Illinois State Toll Highway Authority, or who is the spouse or minor child of any such person to have or acquire any contract, or any direct pecuniary interest in any contract therein, whether for stationery, printing, paper, or any services, materials, or supplies, that will be wholly or partially satisfied by the payment of funds appropriated by the General Assembly of the State of Illinois or in any contract of the Capital Development Board or the Illinois State Toll Highway Authority.

(b) Interests. It is unlawful for any firm, partnership, association or corporation, in which any person listed in subsection (a) is entitled to receive (i) more than 7 1/2% of the total distributable income or (ii) an amount in excess of the salary of the Governor, to have or acquire any such contract or direct pecuniary interest therein.

(c) Combined interests. It is unlawful for any firm, partnership, association, or corporation, in which any person listed in subsection (a) together with his or her spouse or minor children is entitled to receive (i) more than 15%, in the aggregate, of the total distributable income or (ii) an amount in excess of 2 times the salary of the Governor, to have or acquire any such contract or direct pecuniary interest therein.

(d) Securities. Nothing in this Section invalidates the provisions of any bond or other security previously offered or to be offered for sale or sold by or for the State of Illinois.

(e) Prior interests. This Section does not affect the validity of any contract made between the State and an officer or employee of the State or member of the General Assembly, his or her spouse, minor child or any combination of those persons if that contract was in existence before his or her election or employment as an officer, member, or employee. The contract is voidable, however, if it cannot be completed within 365 days after the officer, member, or employee takes office or is employed.

The current salary of the Governor is \$177,412.00. Sixty percent of the salary is \$106,447.20.

## RETURN WITH BID

The bidder assures the Department that the award and execution of the contract would not cause a violation of Section 50-13, or that an effective exemption has been issued by the Board of Ethics to any individual subject to the Section 50-13 prohibitions pursuant to the provisions of Section 50-20 of the Code. Information concerning the exemption process is available from the Department upon request.

### **B. Negotiations**

Section 50-15. Negotiations.

It is unlawful for any person employed in or on a continual contractual relationship with any of the offices or agencies of State government to participate in contract negotiations on behalf of that office or agency with any firm, partnership, association, or corporation with whom that person has a contract for future employment or is negotiating concerning possible future employment.

The bidder assures the Department that the award and execution of the contract would not cause a violation of Section 50-15, and that the bidder has no knowledge of any facts relevant to the kinds of acts prohibited therein.

### **C. Inducements**

Section 50-25. Inducement.

Any person who offers or pays any money or other valuable thing to any person to induce him or her not to bid for a State contract or as recompense for not having bid on a State contract is guilty of a Class 4 felony. Any person who accepts any money or other valuable thing for not bidding for a State contract or who withholds a bid in consideration of the promise for the payment of money or other valuable thing is guilty of a Class 4 felony.

The bidder assures the Department that the award and execution of the contract would not cause a violation of Section 50-25, and that the bidder has no knowledge of any facts relevant to the kinds of acts prohibited therein.

### **D. Revolving Door Prohibition**

Section 50-30. Revolving door prohibition.

CPOs, SPOs, procurement compliance monitors, their designees whose principal duties are directly related to State procurement, and executive officers confirmed by the Senate are expressly prohibited for a period of 2 years after terminating an affected position from engaging in any procurement activity relating to the State agency most recently employing them in an affected position for a period of at least 6 months. The prohibition includes, but is not limited to: lobbying the procurement process; specifying; bidding; proposing bid, proposal, or contract documents; on their own behalf or on behalf of any firm, partnership, association, or corporation. This Section applies only to persons who terminate an affected position on or after January 15, 1999.

The bidder assures the Department that the award and execution of the contract would not cause a violation of Section 50-30, and that the bidder has no knowledge of any facts relevant to the kinds of acts prohibited therein.

### **E. Reporting Anticompetitive Practices**

Section 50-40. Reporting anticompetitive practices.

When, for any reason, any vendor, bidder, contractor, CPO, SPO, designee, elected official, or State employee suspects collusion or other anticompetitive practice among any bidders, offerors, contractors, proposers, or employees of the State, a notice of the relevant facts shall be transmitted to the Attorney General and the CPO.

The bidder assures the Department that it has not failed to report any relevant facts concerning the practices addressed in Section 50-40 which may involve the contract for which the bid is submitted.

### **F. Confidentiality**

Section 50-45. Confidentiality.

Any CPO, SPO, designee, or executive officer who willfully uses or allows the use of specifications, competitive bid documents, proprietary competitive information, proposals, contracts, or selection information to compromise the fairness or integrity of the procurement, bidding, or contract process shall be subject to immediate dismissal, regardless of the Personnel code, any contract, or any collective bargaining agreement, and may in addition be subject to criminal prosecution.

The bidder assures the Department that it has no knowledge of any fact relevant to the practices addressed in Section 50-45 which may involve the contract for which the bid is submitted.

## RETURN WITH BID

### G. Insider Information

Section 50-50. Insider information.

It is unlawful for any current or former elected or appointed State official or State employee to knowingly use confidential information available only by virtue of that office or employment for actual or anticipated gain for themselves or another person.

The bidder assures the Department that it has no knowledge of any facts relevant to the practices addressed in Section 50-50 which may involve the contract for which the bid is submitted.

I acknowledge, understand and accept these terms and conditions for the above assurances.

### III. CERTIFICATIONS

The certifications hereinafter made by the bidder are each a material representation of fact upon which reliance is placed should the Department enter into the contract with the bidder. Section 50-2 of the Code provides that every person that has entered into a multi-year contract and every subcontractor with a multi-year subcontract shall certify, by July 1 of each fiscal year covered by the contract after the initial fiscal year, to the responsible CPO whether it continues to satisfy the requirements of Article 50 pertaining to the eligibility for a contract award. If a contractor or subcontractor is not able to truthfully certify that it continues to meet all requirements, it shall provide with its certification a detailed explanation of the circumstances leading to the change in certification status. A contractor or subcontractor that makes a false statement material to any given certification required under Article 50 is, in addition to any other penalties or consequences prescribed by law, subject to liability under the Whistleblower Reward and Protection Act for submission of a false claim.

#### A. Bribery

Section 50-5. Bribery.

(a) Prohibition. No person or business shall be awarded a contract or subcontract under this Code who:

(1) has been convicted under the laws of Illinois or any other state of bribery or attempting to bribe an officer or employee of the State of Illinois or any other state in that officer's or employee's official capacity; or

(2) has made an admission of guilt of that conduct that is a matter of record but has not been prosecuted for that conduct.

(b) Businesses. No business shall be barred from contracting with any unit of State or local government, or subcontracting under such a contract, as a result of a conviction under this Section of any employee or agent of the business if the employee or agent is no longer employed by the business and:

(1) the business has been finally adjudicated not guilty; or

(2) the business demonstrates to the governmental entity with which it seeks to contract, or which is signatory to the contract which the subcontract relates, and that entity finds that the commission of the offense was not authorized, requested, commanded, or performed by a director, officer, or high managerial agent on behalf of the business as provided in paragraph (2) of subsection (a) of Section 5-4 of the Criminal Code of 2012.

(c) Conduct on behalf of business. For purposes of this Section, when an official, agent, or employee of a business committed the bribery or attempted bribery on behalf of the business and in accordance with the direction or authorization of a responsible official of the business, the business shall be chargeable with the conduct.

(d) Certification. Every bid submitted to and contract executed by the State, and every subcontract subject to Section 20-120 of the Code shall contain a certification by the contractor or the subcontractor, respectively, that the contractor or subcontractor is not barred from being awarded a contract or subcontract under this Section and acknowledges that the CPO may declare the related contract void if any certifications required by this Section are false. A contractor who makes a false statement, material to the certification, commits a Class 3 felony.

The contractor or subcontractor certifies that it is not barred from being awarded a contract under Section 50.5.

#### B. Felons

Section 50-10. Felons.

(a) Unless otherwise provided, no person or business convicted of a felony shall do business with the State of Illinois or any State agency, or enter into a subcontract, from the date of conviction until 5 years after the date of completion of the sentence for that felony, unless no person held responsible by a prosecutorial office for the facts upon which the conviction was based continues to have any involvement with the business.

(b) Certification. Every bid submitted to and contract executed by the State and every subcontract subject to Section 20-120 of the Code shall contain a certification by the bidder or contractor or subcontractor, respectively, that the bidder, contractor, or subcontractor is not barred from being awarded a contract or subcontract under this Section and acknowledges that the CPO may declare the related contract void if any of the certifications required by this Section are false.

## RETURN WITH BID

### **C. Debt Delinquency**

Section 50-11 and 50-12. Debt Delinquency.

The contractor or bidder or subcontractor, respectively, certifies that it, or any affiliate, is not barred from being awarded a contract or subcontract under the Code. Section 50-11 prohibits a person from entering into a contract with a State agency, or entering into a subcontract, if it knows or should know that it, or any affiliate, is delinquent in the payment of any debt to the State as defined by the Debt Collection Board. Section 50-12 prohibits a person from entering into a contract with a State agency, or entering into a subcontract, if it, or any affiliate, has failed to collect and remit Illinois Use Tax on all sales of tangible personal property into the State of Illinois in accordance with the provisions of the Illinois Use Tax Act. The bidder or contractor or subcontractor, respectively, further acknowledges that the CPO may declare the related contract void if this certification is false or if the bidder, contractor, or subcontractor, or any affiliate, is determined to be delinquent in the payment of any debt to the State during the term of the contract.

### **D. Prohibited Bidders, Contractors and Subcontractors**

Section 50-10.5 and 50-60(c). Prohibited bidders, contractors and subcontractors.

The bidder or contractor or subcontractor, respectively, certifies in accordance with 30 ILCS 500/50-10.5 that no officer, director, partner or other managerial agent of the contracting business has been convicted of a felony under the Sarbanes-Oxley Act of 2002 or a Class 3 or Class 2 felony under the Illinois Securities Law of 1953 or if in violation of Subsection (c) for a period of five years from the date of conviction. Every bid submitted to and contract executed by the State and every subcontract subject to Section 20-120 of the Code shall contain a certification by the bidder, contractor, or subcontractor, respectively, that the bidder, contractor, or subcontractor is not barred from being awarded a contract or subcontract under this Section and acknowledges that the CPO shall declare the related contract void if any of the certifications completed pursuant to this Section are false.

### **E. Section 42 of the Environmental Protection Act**

The bidder or contractor or subcontractor, respectively, certifies in accordance with 30 ILCS 500/50-14 that the bidder, contractor, or subcontractor, is not barred from being awarded a contract or entering into a subcontract under this Section which prohibits the bidding on or entering into contracts with the State of Illinois or a State agency, or entering into any subcontract, that is subject to the Code by a person or business found by a court or the Pollution Control Board to have committed a willful or knowing violation of Section 42 of the Environmental Protection Act for a period of five years from the date of the order. The bidder or contractor or subcontractor, respectively, acknowledges that the CPO may declare the contract void if this certification is false.

### **F. Educational Loan**

Section 3 of the Educational Loan Default Act provides no State agency shall contract with an individual for goods or services if that individual is in default, as defined in Section 2 of this Act, on an educational loan. Any contract used by any State agency shall include a statement certifying that the individual is not in default on an educational loan as provided in this Section.

The bidder, if an individual as opposed to a corporation, partnership or other form of business organization, certifies that the bidder is not in default on an educational loan as provided in Section 3 of the Act.

### **G. Bid-Rigging/Bid Rotating**

Section 33E-11 of the Criminal Code of 2012 provides:

(a) Every bid submitted to and public contract executed pursuant to such bid by the State or a unit of local government shall contain a certification by the prime contractor that the prime contractor is not barred from contracting with any unit of State or local government as a result of a violation of either Section 33E-3 or 33E-4 of this Article.

(b) A contractor who makes a false statement, material to the certification, commits a Class 3 felony.

A violation of Section 33E-3 would be represented by a conviction of the crime of bid-rigging which, in addition to Class 3 felony sentencing, provides that any person convicted of this offense or any similar offense of any state or the United States which contains the same elements as this offense shall be barred for 5 years from the date of conviction from contracting with any unit of State or local government. No corporation shall be barred from contracting with any unit of State or local government as a result of a conviction under this Section of any employee or agent of such corporation if the employee so convicted is no longer employed by the corporation and: (1) it has been finally adjudicated not guilty or (2) if it demonstrates to the governmental entity with which it seeks to contract and that entity finds that the commission of the offense was neither authorized, requested, commanded, nor performed by a director, officer or a high managerial agent in behalf of the corporation.

## RETURN WITH BID

A violation of Section 33E-4 would be represented by a conviction of the crime of bid-rotating which, in addition to Class 2 felony sentencing, provides that any person convicted of this offense or any similar offense of any state or the United States which contains the same elements as this offense shall be permanently barred from contracting with any unit of State or local government. No corporation shall be barred from contracting with any unit of State or local government as a result of a conviction under this Section of any employee or agent of such corporation if the employee so convicted is no longer employed by the corporation and: (1) it has been finally adjudicated not guilty or (2) if it demonstrates to the governmental entity with which it seeks to contract and that entity finds that the commission of the offense was neither authorized, requested, commanded, nor performed by a director, officer or a high managerial agent in behalf of the corporation.

The bidder certifies that it is not barred from contracting with the Department by reason of a violation of either Section 33E-3 or Section 33E-4.

### **H. International Anti-Boycott**

Section 5 of the International Anti-Boycott Certification Act provides every contract entered into by the State of Illinois for the manufacture, furnishing, or purchasing of supplies, material, or equipment or for the furnishing of work, labor, or services, in an amount exceeding the threshold for small purchases according to the purchasing laws of this State or \$10,000.00, whichever is less, shall contain certification, as a material condition of the contract, by which the contractor agrees that neither the contractor nor any substantially-owned affiliated company is participating or shall participate in an international boycott in violation of the provisions of the U.S. Export Administration Act of 1979 or the regulations of the U.S. Department of Commerce promulgated under that Act.

The bidder makes the certification set forth in Section 5 of the Act.

### **I. Drug Free Workplace**

The Illinois "Drug Free Workplace Act" applies to this contract and it is necessary to comply with the provisions of the "Act" if the contractor is a corporation, partnership, or other entity (including a sole proprietorship) which has 25 or more employees.

The bidder certifies that if awarded a contract in excess of \$5,000 it will provide a drug free workplace in compliance with the provisions of the Act.

### **J. Disclosure of Business Operations in Iran**

Section 50-36 of the Code, 30ILCS 500/50-36 provides that each bid, offer, or proposal submitted for a State contract shall include a disclosure of whether or not the Company acting as the bidder, offeror, or proposing entity, or any of its corporate parents or subsidiaries, within the 24 months before submission of the bid, offer, or proposal had business operations that involved contracts with or provision of supplies or services to the Government of Iran, companies in which the Government of Iran has any direct or indirect equity share, consortiums or projects commissioned by the Government of Iran, or companies involved in consortiums or projects commissioned by the Government of Iran and either of the following conditions apply:

- (1) More than 10% of the Company's revenues produced in or assets located in Iran involve oil-related activities or mineral-extraction activities; less than 75% of the Company's revenues produced in or assets located in Iran involve contracts with or provision of oil-related or mineral-extraction products or services to the Government of Iran or a project or consortium created exclusively by that government; and the Company has failed to take substantial action.
- (2) The Company has, on or after August 5, 1996, made an investment of \$20 million or more, or any combination of investments of at least \$10 million each that in the aggregate equals or exceeds \$20 million in any 12-month period, which directly or significantly contributes to the enhancement of Iran's ability to develop petroleum resources of Iran.

The terms "Business operations", "Company", "Mineral-extraction activities", "Oil-related activities", "Petroleum resources", and "Substantial action" are all defined in the Code.

Failure to make the disclosure required by the Code shall cause the bid, offer or proposal to be considered not responsive. The disclosure will be considered when evaluating the bid or awarding the contract. The name of each Company disclosed as doing business or having done business in Iran will be provided to the State Comptroller.

Check the appropriate statement:

Company has no business operations in Iran to disclose.

Company has business operations in Iran as disclosed the attached document.

## RETURN WITH BID

### **K. Apprenticeship and Training Certification (Does not apply to federal aid projects)**

In accordance with the provisions of Section 30-22 (6) of the Code, the bidder certifies that it is a participant, either as an individual or as part of a group program, in the approved apprenticeship and training programs applicable to each type of work or craft that the bidder will perform with its own forces. The bidder further certifies for work that will be performed by subcontract that each of its subcontractors submitted for approval either (a) is, at the time of such bid, participating in an approved, applicable apprenticeship and training program; or (b) will, prior to commencement of performance of work pursuant to this contract, begin participation in an approved apprenticeship and training program applicable to the work of the subcontract. The Department, at any time before or after award, may require the production of a copy of each applicable Certificate of Registration issued by the United States Department of Labor evidencing such participation by the contractor and any or all of its subcontractors. Applicable apprenticeship and training programs are those that have been approved and registered with the United States Department of Labor. The bidder shall list in the space below, the official name of the program sponsor holding the Certificate of Registration for all of the types of work or crafts in which the bidder is a participant and that will be performed with the bidder's forces. Types of work or craft work that will be subcontracted shall be included and listed as subcontract work. The list shall also indicate any type of work or craft job category that does not have an applicable apprenticeship or training program. **The bidder is responsible for making a complete report and shall make certain that each type of work or craft job category that will be utilized on the project as reported on the Construction Employee Workforce Projection (Form BC-1256) and returned with the bid is accounted for and listed.**

**NA-FEDERAL**

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The requirements of this certification and disclosure are a material part of the contract, and the contractor shall require this certification provision to be included in all approved subcontracts. In order to fulfill this requirement, it shall not be necessary that an applicable program sponsor be currently taking or that it will take applications for apprenticeship, training or employment during the performance of the work of this contract.



**RETURN WITH BID**

**L. Political Contributions and Registration with the State Board of Elections**

Sections 20-160 and 50-37 of the Code regulate political contributions from business entities and any affiliated entities or affiliated persons bidding on or contracting with the state. Generally under Section 50-37, any business entity, and any affiliated entity or affiliated person of the business entity, whose current year contracts with all state agencies exceed an awarded value of \$50,000, are prohibited from making any contributions to any political committees established to promote the candidacy of the officeholder responsible for the awarding of the contracts or any other declared candidate for that office for the duration of the term of office of the incumbent officeholder or a period 2 years after the termination of the contract, whichever is longer. Any business entity and affiliated entities or affiliated persons whose state contracts in the current year do not exceed an awarded value of \$50,000, but whose aggregate pending bids and proposals on state contracts exceed \$50,000, either alone or in combination with contracts not exceeding \$50,000, are prohibited from making any political contributions to any political committee established to promote the candidacy of the officeholder responsible for awarding the pending contract during the period beginning on the date the invitation for bids or request for proposals is issued and ending on the day after the date of award or selection if the entity was not awarded or selected. Section 20-160 requires certification of registration of affected business entities in accordance with procedures found in Section 9-35 of The Election Code.

By submission of a bid, the contractor business entity acknowledges and agrees that it has read and understands Sections 20-160 and 50-37 of the Code, and that it makes the following certification:

**The undersigned bidder certifies that it has registered as a business with the State Board of Elections and acknowledges a continuing duty to update the registration in accordance with the above referenced statutes. If the business entity is required to register, the CPO shall verify that it is in compliance on the date the bid or proposal is due. The CPO shall not accept a bid or proposal if the business entity is not in compliance with the registration requirements.**

These requirements and compliance with the above referenced statutory sections are a material part of the contract, and any breach thereof shall be cause to void the contract under Section 50-60 of the Code. This provision does not apply to Federal-aid contracts.

**M. Lobbyist Disclosure**

Section 50-38 of the Code requires that any bidder or offeror on a State contract that hires a person required to register under the Lobbyist Registration Act to assist in obtaining a contract shall:

- (i) Disclose all costs, fees, compensation, reimbursements, and other remunerations paid or to be paid to the lobbyist related to the contract,
- (ii) Not bill or otherwise cause the State of Illinois to pay for any of the lobbyist's costs, fees, compensation, reimbursements, or other remuneration, and
- (iii) Sign a verification certifying that none of the lobbyist's costs, fees, compensation, reimbursements, or other remuneration were billed to the State.

This information, along with all supporting documents, shall be filed with the agency awarding the contract and with the Secretary of State. The CPO shall post this information, together with the contract award notice, in the online Procurement Bulletin.

Pursuant to Subsection (c) of this Section, no person or entity shall retain a person or entity to attempt to influence the outcome of a procurement decision made under the Code for compensation contingent in whole or in part upon the decision or procurement. Any person who violates this subsection is guilty of a business offense and shall be fined not more than \$10,000.

Bidder acknowledges that it is required to disclose the hiring of any person required to register pursuant to the Illinois Lobbyist Registration Act (25 ILCS 170) in connection with this contract.

Bidder has not hired any person required to register pursuant to the Illinois Lobbyist Registration Act in connection with this contract.

Or

Bidder has hired the following persons required to register pursuant to the Illinois Lobbyist Registration Act in connection with the contract:

Name and address of person: \_\_\_\_\_  
All costs, fees, compensation, reimbursements and other remuneration paid to said person: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

I acknowledge, understand and accept these terms and conditions for the above certifications.

## RETURN WITH BID

### IV. DISCLOSURES

- A. The disclosures hereinafter made by the bidder are each a material representation of fact upon which reliance is placed should the Department enter into the contract with the bidder. The bidder further certifies that the Department has received the disclosure forms for each bid.

The CPO may void the bid, or contract, respectively, if it is later determined that the bidder or subcontractor rendered a false or erroneous disclosure. A contractor or subcontractor may be suspended or debarred for violations of the Code. Furthermore, the CPO may void the contract and the surety providing the performance bond shall be responsible for completion of the contract.

### B. Financial Interests and Conflicts of Interest

1. Section 50-35 of the Code provides that all bids of more than \$25,000 shall be accompanied by disclosure of the financial interests of the bidder. This disclosed information for the successful bidder, will be maintained as public information subject to release by request pursuant to the Freedom of Information Act, filed with the Procurement Policy Board, and shall be incorporated as a material term of the contract. Furthermore, pursuant to Section 5-5, the Procurement Policy Board may review a proposal, bid, or contract and issue a recommendation to void a contract or reject a proposal or bid based on any violation of the Code or the existence of a conflict of interest as provided in subsections (b) and (d) of Section 50-35.

The financial interests to be disclosed shall include ownership or distributive income share that is in excess of 5%, or an amount greater than 60% of the annual salary of the Governor, of the bidding entity or its parent entity, whichever is less, unless the contractor or bidder is a publicly traded entity subject to Federal 10K reporting, in which case it may submit its 10K disclosure in place of the prescribed disclosure. If a bidder is a privately held entity that is exempt from Federal 10K reporting, but has more than 200 shareholders, it may submit the information that Federal 10K companies are required to report, and list the names of any person or entity holding any ownership share that is in excess of 5%. The disclosure shall include the names, addresses, and dollar or proportionate share of ownership of each person making the disclosure, their instrument of ownership or beneficial relationship, and notice of any potential conflict of interest resulting from the current ownership or beneficial interest of each person making the disclosure having any of the relationships identified in Section 50-35 and on the disclosure form.  
**The current annual salary of the Governor is \$177,412.00.**

In addition, all disclosures shall indicate any other current or pending contracts, proposals, leases, or other ongoing procurement relationships the bidding entity has with any other unit of state government and shall clearly identify the unit and the contract, proposal, lease, or other relationship.

2. Disclosure Forms. Disclosure Form A is attached for use concerning the individuals meeting the above ownership or distributive share requirements. A separate Disclosure Form A must be submitted with the bid for each individual meeting the above requirements. In addition, a second form (Disclosure Form B) provides for the disclosure of current or pending procurement relationships with other (non-IDOT) state agencies and a total ownership certification. **The forms must be included with each bid.**

### C. Disclosure Form Instructions

#### Form A Instructions for Financial Information & Potential Conflicts of Interest

If the bidder is a publicly traded entity subject to Federal 10K reporting, the 10K Report may be submitted to meet the requirements of Form A. If a bidder is a privately held entity that is exempt from Federal 10K reporting, but has more than 200 shareholders, it may submit the information that Federal 10K companies are required to report, and list the names of any person or entity holding any ownership share that is in excess of 5%. If a bidder is not subject to Federal 10K reporting, the bidder must determine if any individuals are required by law to complete a financial disclosure form. To do this, the bidder should answer each of the following questions. A "YES" answer indicates Form A must be completed. If the answer to each of the following questions is "NO", then the NOT APPLICABLE STATEMENT on Form A must be signed and dated by a person that is authorized to execute contracts for the bidding company. Note: These questions are for assistance only and are not required to be completed.

1. Does anyone in your organization have a direct or beneficial ownership share of greater than 5% of the bidding entity or parent entity? YES \_\_\_ NO \_\_\_
2. Does anyone in your organization have a direct or beneficial ownership share of less than 5%, but which has a value greater than 60% of the annual salary of the Governor? YES \_\_\_ NO \_\_\_
3. Does anyone in your organization receive more than 60% of the annual salary of the Governor of the bidding entity's or parent entity's distributive income? YES \_\_\_ NO \_\_\_
4. Does anyone in your organization receive greater than 5% of the bidding entity's or parent entity's total distributive income, but which is less than 60% of the annual salary of the Governor? YES \_\_\_ NO \_\_\_

(Note: Only one set of forms needs to be completed per person per bid even if a specific individual would require a yes answer to more than one question.)

A "YES" answer to any of these questions requires the completion of Form A. The bidder must determine each individual in the bidding entity or the bidding entity's parent company that would cause the questions to be answered "Yes". Each form must be signed and dated by a person that is authorized to execute contracts for your organization. **Photocopied or stamped signatures are not acceptable.** The person signing can be, but does not have to be, the person for which the form is being completed. The bidder is responsible for the accuracy of any information provided.

If the answer to each of the above questions is "NO", then the NOT APPLICABLE STATEMENT of Form A must be signed and dated by a person that is authorized to execute contracts for your company.

## RETURN WITH BID

### **Form B: Instructions for Identifying Other Contracts & Procurement Related Information**

Disclosure Form B must be completed for each bid submitted by the bidding entity. *Note: Checking the NOT APPLICABLE STATEMENT on Form A does not allow the bidder to ignore Form B. Form B must be completed, checked, and dated or the bidder may be considered nonresponsive and the bid will not be accepted.*

The Bidder shall identify, by checking Yes or No on Form B, whether it has any pending contracts (including leases), bids, proposals, or other ongoing procurement relationship with any other (non-IDOT) State of Illinois agency. If "No" is checked, the bidder only needs to complete the check box on the bottom of Form B. If "Yes" is checked, the bidder must do one of the following:

Option I: If the bidder did not submit an Affidavit of Availability to obtain authorization to bid, the bidder must list all non-IDOT State of Illinois agency pending contracts, leases, bids, proposals, and other ongoing procurement relationships. These items may be listed on Form B or on an attached sheet(s). Do not include IDOT contracts. Contracts with cities, counties, villages, etc. are not considered State of Illinois agency contracts and are not to be included. Contracts with other State of Illinois agencies such as the Department of Natural Resources or the Capital Development Board must be included. Bidders who submit Affidavits of Availability are suggested to use Option II.

Option II: If the bidder is required and has submitted an Affidavit of Availability in order to obtain authorization to bid, the bidder may write or type "See Affidavit of Availability" which indicates that the Affidavit of Availability is incorporated by reference and includes all non-IDOT State of Illinois agency pending contracts, leases, bids, proposals, and other ongoing procurement relationships. For any contracts that are not covered by the Affidavit of Availability, the bidder must identify them on Form B or on an attached sheet(s). These might be such things as leases.

RETURN WITH BID

ILLINOIS DEPARTMENT OF TRANSPORTATION

Form A Financial Information & Potential Conflicts of Interest Disclosure

Contractor Name
Legal Address
City, State, Zip
Telephone Number Email Address Fax Number (if available)

Disclosure of the information contained in this Form is required by the Section 50-35 of the Code (30 ILCS 500). Vendors desiring to enter into a contract with the State of Illinois must disclose the financial information and potential conflict of interest information as specified in this Disclosure Form. This information shall become part of the publicly available contract file. This Form A must be completed for bids in excess of \$25,000, and for all open-ended contracts. A publicly traded company may submit a 10K disclosure (or equivalent if applicable) in satisfaction of the requirements set forth in Form A. See Disclosure Form Instructions.

The current annual salary of the Governor is \$177,412.00.

DISCLOSURE OF FINANCIAL INFORMATION

- 1. Disclosure of Financial Information. The individual named below has an interest in the BIDDER (or its parent) in terms of ownership or distributive income share in excess of 5%, or an interest which has a value of more than 60% of the annual salary of the Governor. (Make copies of this form as necessary and attach a separate Disclosure Form A for each individual meeting these requirements)

FOR INDIVIDUAL (type or print information)
NAME:
ADDRESS
Type of ownership/distributable income share:
stock sole proprietorship Partnership other: (explain on separate sheet):
% or \$ value of ownership/distributable income share:

- 2. Disclosure of Potential Conflicts of Interest. Check "Yes" or "No" to indicate which, if any, of the following potential conflict of interest relationships apply. If the answer to any question is "Yes", please attach additional pages and describe.

(a) State employment, currently or in the previous 3 years, including contractual employment of services. Yes \_\_\_ No \_\_\_

If your answer is yes, please answer each of the following questions.

- 1. Are you currently an officer or employee of either the Capitol Development Board or the Illinois State Toll Highway Authority? Yes \_\_\_ No \_\_\_
2. Are you currently appointed to or employed by any agency of the State of Illinois? If you are currently appointed to or employed by any agency of the State of Illinois, and your annual salary exceeds 60% of the annual salary of the Governor provide the name the State agency for which you are employed and your annual salary.

**RETURN WITH BID**

3. If you are currently appointed to or employed by any agency of the State of Illinois, and your annual salary exceeds 60% of the annual salary of the Governor, are you entitled to receive (i) more than 7 1/2% of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess of 100% of the annual salary of the Governor? Yes \_\_\_ No \_\_\_
4. If you are currently appointed to or employed by any agency of the State of Illinois, and your annual salary exceeds 60% of the annual salary of the Governor, are you and your spouse or minor children entitled to receive (i) more than 15% in aggregate of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess of two times the salary of the Governor? Yes \_\_\_ No \_\_\_

---

(b) State employment of spouse, father, mother, son, or daughter, including contractual employment for services in the previous 2 years.

Yes \_\_\_ No \_\_\_

If your answer is yes, please answer each of the following questions.

1. Is your spouse or any minor children currently an officer or employee of the Capitol Development Board or the Illinois State Toll Highway Authority? Yes \_\_\_ No \_\_\_
2. Is your spouse or any minor children currently appointed to or employed by any agency of the State of Illinois? If your spouse or minor children is/are currently appointed to or employed by any agency of the State of Illinois, and his/her annual salary exceeds 60% of the annual salary of the Governor, provide the name of the spouse and/or minor children, the name of the State agency for which he/she is employed and his/her annual salary. \_\_\_\_\_
- 
3. If your spouse or any minor children is/are currently appointed to or employed by any agency of the State of Illinois, and his/her annual salary exceeds 60% of the annual salary of the Governor, are you entitled to receive (i) more than 7 1/2% of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess 100% of the annual salary of the Governor? Yes \_\_\_ No \_\_\_
4. If your spouse or any minor children are currently appointed to or employed by any agency of the State of Illinois, and his/her annual salary exceeds 60% of the annual salary of the Governor, are you and your spouse or any minor children entitled to receive (i) more than 15% in the aggregate of the total distributable income from your firm, partnership, association or corporation, or (ii) an amount in excess of two times the salary of the Governor? Yes \_\_\_ No \_\_\_

---

(c) Elective status; the holding of elective office of the State of Illinois, the government of the United States, any unit of local government authorized by the Constitution of the State of Illinois or the statutes of the State of Illinois currently or in the previous 3 years. Yes \_\_\_ No \_\_\_

---

(d) Relationship to anyone holding elective office currently or in the previous 2 years; spouse, father, mother, son, or daughter. Yes \_\_\_ No \_\_\_

---

(e) Appointive office; the holding of any appointive government office of the State of Illinois, the United State of America, or any unit of local government authorized by the Constitution of the State of Illinois or the statutes of the State of Illinois, which office entitles the holder to compensation in excess of the expenses incurred in the discharge of that office currently or in the previous 3 years. Yes \_\_\_ No \_\_\_

---

(f) Relationship to anyone holding appointive office currently or in the previous 2 years; spouse, father, mother, son, or daughter. Yes \_\_\_ No \_\_\_

---

(g) Employment, currently or in the previous 3 years, as or by any registered lobbyist of the State government. Yes \_\_\_ No \_\_\_

---

**RETURN WITH BID**

(h) Relationship to anyone who is or was a registered lobbyist in the previous 2 years; spouse, father, mother, son, or daughter. Yes \_\_\_ No \_\_\_

---

(i) Compensated employment, currently or in the previous 3 years, by any registered election or reelection committee registered with the Secretary of State or any county clerk of the State of Illinois, or any political action committee registered with either the Secretary of State or the Federal Board of Elections. Yes \_\_\_ No \_\_\_

---

(j) Relationship to anyone; spouse, father, mother, son, or daughter; who was a compensated employee in the last 2 years by any registered election or re-election committee registered with the Secretary of State or any county clerk of the State of Illinois, or any political action committee registered with either the Secretary of State or the Federal Board of Elections. Yes \_\_\_ No \_\_\_

---

**3. Communication Disclosure.**

Disclose the name and address of each lobbyist and other agent of the bidder or offeror who is not identified in Section 2 of this form, who is has communicated, is communicating, or may communicate with any State officer or employee concerning the bid or offer. This disclosure is a continuing obligation and must be promptly supplemented for accuracy throughout the process and throughout the term of the contract. If no person is identified, enter "None" on the line below:

Name and address of person(s): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**RETURN WITH BID**

**4. Debarment Disclosure.** For each of the persons identified under Sections 2 and 3 of this form, disclose whether any of the following has occurred within the previous 10 years: debarment from contracting with any governmental entity; professional licensure discipline; bankruptcies; adverse civil judgments and administrative findings; and criminal felony convictions. This disclosure is a continuing obligation and must be promptly supplemented for accuracy throughout the procurement process and term of the contract. If no person is identified, enter "None" on the line below:

Name of person(s): \_\_\_\_\_

Nature of disclosure: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**APPLICABLE STATEMENT**

**This Disclosure Form A is submitted on behalf of the INDIVIDUAL named on previous page. Under penalty of perjury, I certify the contents of this disclosure to be true and accurate to the best of my knowledge.**

Completed by:  \_\_\_\_\_  
Signature of Individual or Authorized Representative Date

**NOT APPLICABLE STATEMENT**

**Under penalty of perjury, I have determined that no individuals associated with this organization meet the criteria that would require the completion of this Form A.**

**This Disclosure Form A is submitted on behalf of the CONTRACTOR listed on the previous page.**

\_\_\_\_\_  
Signature of Authorized Representative Date

The bidder has a continuing obligation to supplement these disclosures under Sec. 50-35 of the Code.

RETURN WITH BID

ILLINOIS DEPARTMENT OF TRANSPORTATION

Form B Other Contracts & Financial Related Information Disclosure

Contractor Name, Legal Address, City, State, Zip, Telephone Number, Email Address, Fax Number (if available)

Disclosure of the information contained in this Form is required by the Section 50-35 of the Code (30 ILCS 500). This information shall become part of the publicly available contract file. This Form B must be completed for bids in excess of \$25,000, and for all open-ended contracts.

DISCLOSURE OF OTHER CONTRACTS AND PROCUREMENT RELATED INFORMATION

1. Identifying Other Contracts & Procurement Related Information. The BIDDER shall identify whether it has any pending contracts (including leases), bids, proposals, or other ongoing procurement relationship with any other State of Illinois agency: Yes \_\_\_ No \_\_\_

If "No" is checked, the bidder only needs to complete the signature box on the bottom of this page.

2. If "Yes" is checked. Identify each such relationship by showing State of Illinois agency name and other descriptive information such as bid or project number (attach additional pages as necessary). SEE DISCLOSURE FORM INSTRUCTIONS:

THE FOLLOWING STATEMENT MUST BE CHECKED

Signature of Authorized Representative, Date

OWNERSHIP CERTIFICATION

Please certify that the following statement is true if the individuals for all submitted Form A disclosures do not total 100% of ownership.

Any remaining ownership interest is held by individuals receiving less than \$106,447.20 of the bidding entity's or parent entity's distributive income or holding less than a 5% ownership interest.

Yes No N/A (Form A disclosure(s) established 100% ownership)



## **RETURN WITH BID**

### **SPECIAL NOTICE TO CONTRACTORS**

The following requirements of the Illinois Department of Human Rights' Rules and Regulations are applicable to bidders on all construction contracts advertised by the Illinois Department of Transportation:

#### **CONSTRUCTION EMPLOYEE UTILIZATION PROJECTION**

- (a) All bidders on construction contracts shall complete and submit, along with and as part of their bids, a Bidder's Employee Utilization Form (Form BC-1256) setting forth a projection and breakdown of the total workforce intended to be hired and/or allocated to such contract work by the bidder including a projection of minority and female employee utilization in all job classifications on the contract project.
- (b) The Department of Transportation shall review the Employee Utilization Form, and workforce projections contained therein, of the contract awardee to determine if such projections reflect an underutilization of minority persons and/or women in any job classification in accordance with the Equal Employment Opportunity Clause and Section 7.2 of the Illinois Department of Human Rights' Rules and Regulations for Public Contracts adopted as amended on September 17, 1980. If it is determined that the contract awardee's projections reflect an underutilization of minority persons and/or women in any job classification, it shall be advised in writing of the manner in which it is underutilizing and such awardee shall be considered to be in breach of the contract unless, prior to commencement of work on the contract project, it submits revised satisfactory projections or an acceptable written affirmative action plan to correct such underutilization including a specific timetable geared to the completion stages of the contract.
- (c) The Department of Transportation shall provide to the Department of Human Rights a copy of the contract awardee's Employee Utilization Form, a copy of any required written affirmative action plan, and any written correspondence related thereto. The Department of Human Rights may review and revise any action taken by the Department of Transportation with respect to these requirements.



RETURN WITH BID

Contract No. 60W26
COOK County
Section 2013-008R
Project ACNHPP-000S(947)
Route FAI 90/94/290
District 1 Construction Funds

PART I. IDENTIFICATION

Dept. Human Rights # \_\_\_\_\_ Duration of Project: \_\_\_\_\_
Name of Bidder: \_\_\_\_\_

PART II. WORKFORCE PROJECTION

A. The undersigned bidder has analyzed minority group and female populations, unemployment rates and availability of workers for the location in which this contract work is to be performed, and for the locations from which the bidder recruits employees, and hereby submits the following workforce projection including a projection for minority and female employee utilization in all job categories in the workforce to be allocated to this contract:

Table A: TOTAL Workforce Projection for Contract. Columns include Job Categories, Total Employees (M, F), Minority Employees (Black, Hispanic, \*Other Minor.), and Trainees (Apprentices, On the Job Trainees).

Table B: CURRENT EMPLOYEES TO BE ASSIGNED TO CONTRACT. Columns include Total Employees (M, F) and Minority Employees (M, F).

Table C: TOTAL Training Projection for Contract. Columns include Employees in Training (Apprentices, On the Job Trainees) and their demographic breakdown (Total, Black, Hispanic, \*Other Minor.).

FOR DEPARTMENT USE ONLY

\*Other minorities are defined as Asians (A) or Native Americans (N). Please specify race of each employee shown in Other Minorities column.

Note: See instructions on page 2

**RETURN WITH BID**

**Contract No. 60W26  
COOK County  
Section 2013-008R  
Project ACNHPP-000S(947)  
Route FAI 90/94/290  
District 1 Construction Funds**

**PART II. WORKFORCE PROJECTION - continued**

- B. Included in "Total Employees" under Table A is the total number of **new hires** that would be employed in the event the undersigned bidder is awarded this contract.

The undersigned bidder projects that: (number) \_\_\_\_\_ new hires would be recruited from the area in which the contract project is located; and/or (number) \_\_\_\_\_ new hires would be recruited from the area in which the bidder's principal office or base of operation is located.

- C. Included in "Total Employees" under Table A is a projection of numbers of persons to be employed directly by the undersigned bidder as well as a projection of numbers of persons to be employed by subcontractors.

The undersigned bidder estimates that (number) \_\_\_\_\_ persons will be directly employed by the prime contractor and that (number) \_\_\_\_\_ persons will be employed by subcontractors.

**PART III. AFFIRMATIVE ACTION PLAN**

- A. The undersigned bidder understands and agrees that in the event the foregoing minority and female employee utilization projection included under **PART II** is determined to be an underutilization of minority persons or women in any job category, and in the event that the undersigned bidder is awarded this contract, he/she will, prior to commencement of work, develop and submit a written Affirmative Action Plan including a specific timetable (geared to the completion stages of the contract) whereby deficiencies in minority and/or female employee utilization are corrected. Such Affirmative Action Plan will be subject to approval by the contracting agency and the **Department of Human Rights**.
- B. The undersigned bidder understands and agrees that the minority and female employee utilization projection submitted herein, and the goals and timetable included under an Affirmative Action Plan if required, are deemed to be part of the contract specifications.

Company \_\_\_\_\_ Telephone Number \_\_\_\_\_

Address \_\_\_\_\_

**NOTICE REGARDING SIGNATURE**

The Bidder's signature on the Proposal Signature Sheet will constitute the signing of this form. The following signature block needs to be completed only if revisions are required.

Signature:  \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_

Instructions: All tables must include subcontractor personnel in addition to prime contractor personnel.

Table A - Include both the number of employees that would be hired to perform the contract work and the total number currently employed (Table B) that will be allocated to contract work, and include all apprentices and on-the-job trainees. The "Total Employees" column should include all employees including all minorities, apprentices and on-the-job trainees to be employed on the contract work.

Table B - Include all employees currently employed that will be allocated to the contract work including any apprentices and on-the-job trainees currently employed.

Table C - Indicate the racial breakdown of the total apprentices and on-the-job trainees shown in Table A.

**RETURN WITH BID**

**ADDITIONAL FEDERAL REQUIREMENTS**

In addition to the Required Contract Provisions for Federal-Aid Construction Contracts (FHWA 1273), all bidders make the following certifications.

- A. By the execution of this proposal, the signing bidder certifies that the bidding entity has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action, in restraint of free competitive bidding in connection with the submitted bid. This statement made by the undersigned bidder is true and correct under penalty of perjury under the laws of the United States.
- B. CERTIFICATION, EQUAL EMPLOYMENT OPPORTUNITY:
1. Have you participated in any previous contracts or subcontracts subject to the equal opportunity clause. YES \_\_\_\_\_ NO \_\_\_\_\_
  2. If answer to #1 is yes, have you filed with the Joint Reporting Committee, the Director of OFCC, any Federal agency, or the former President's Committee on Equal Employment Opportunity, all reports due under the applicable filing requirements of those organizations? YES \_\_\_\_\_ NO \_\_\_\_\_

**RETURN WITH BID**

**Contract No. 60W26  
COOK County  
Section 2013-008R  
Project ACNHPP-000S(947)  
Route FAI 90/94/290  
District 1 Construction Funds**

PROPOSAL SIGNATURE SHEET

The undersigned bidder hereby makes and submits this bid on the subject Proposal, thereby assuring the Department that all requirements of the Invitation for Bids and rules of the Department have been met, that there is no misunderstanding of the requirements of paragraph 3 of this Proposal, and that the contract will be executed in accordance with the rules of the Department if an award is made on this bid.

(IF AN INDIVIDUAL) Firm Name \_\_\_\_\_  
Signature of Owner \_\_\_\_\_  
Business Address \_\_\_\_\_  
\_\_\_\_\_

(IF A CO-PARTNERSHIP) Firm Name \_\_\_\_\_  
By \_\_\_\_\_  
Business Address \_\_\_\_\_  
Name and Address of All Members of the Firm: \_\_\_\_\_  
\_\_\_\_\_

(IF A CORPORATION) Corporate Name \_\_\_\_\_  
By \_\_\_\_\_  
Signature of Authorized Representative \_\_\_\_\_  
Typed or printed name and title of Authorized Representative \_\_\_\_\_  
Attest \_\_\_\_\_  
Signature \_\_\_\_\_  
(IF A JOINT VENTURE, USE THIS SECTION FOR THE MANAGING PARTY AND THE SECOND PARTY SHOULD SIGN BELOW) Business Address \_\_\_\_\_

(IF A JOINT VENTURE) Corporate Name \_\_\_\_\_  
By \_\_\_\_\_  
Signature of Authorized Representative \_\_\_\_\_  
Typed or printed name and title of Authorized Representative \_\_\_\_\_  
Attest \_\_\_\_\_  
Signature \_\_\_\_\_  
Business Address \_\_\_\_\_

If more than two parties are in the joint venture, please attach an additional signature sheet.



Return with Bid

Division of Highways  
Proposal Bid Bond  
(Effective November 1, 1992)

Item No. \_\_\_\_\_

Letting Date \_\_\_\_\_

KNOW ALL MEN BY THESE PRESENTS, That We \_\_\_\_\_

as PRINCIPAL, and \_\_\_\_\_

\_\_\_\_\_ as SURETY, are held jointly, severally and firmly bound unto the STATE OF ILLINOIS in the penal sum of 5 percent of the total bid price, or for the amount specified in the bid proposal under "Proposal Guaranty" in effect on the date of the Invitation for Bids, whichever is the lesser sum, well and truly to be paid unto said STATE OF ILLINOIS, for the payment of which we bind ourselves, our heirs, executors, administrators, successors and assigns.

THE CONDITION OF THE FOREGOING OBLIGATION IS SUCH, that whereas, the PRINCIPAL has submitted a bid proposal to the STATE OF ILLINOIS, acting through the Department of Transportation, for the improvement designated by the Transportation Bulletin Item Number and Letting Date indicated above.

NOW, THEREFORE, if the Department shall accept the bid proposal of the PRINCIPAL; and if the PRINCIPAL shall, within the time and as specified in the bidding and contract documents, submit a DBE Utilization Plan that is accepted and approved by the Department; and if, after award by the Department, the PRINCIPAL shall enter into a contract in accordance with the terms of the bidding and contract documents including evidence of the required insurance coverages and providing such bond as specified with good and sufficient surety for the faithful performance of such contract and for the prompt payment of labor and material furnished in the prosecution thereof; or if, in the event of the failure of the PRINCIPAL to make the required DBE submission or to enter into such contract and to give the specified bond, the PRINCIPAL pays to the Department the difference not to exceed the penalty hereof between the amount specified in the bid proposal and such larger amount for which the Department may contract with another party to perform the work covered by said bid proposal, then this obligation shall be null and void, otherwise, it shall remain in full force and effect.

IN THE EVENT the Department determines the PRINCIPAL has failed to comply with any requirement as set forth in the preceding paragraph, then Surety shall pay the penal sum to the Department within fifteen (15) days of written demand therefor. If Surety does not make full payment within such period of time, the Department may bring an action to collect the amount owed. Surety is liable to the Department for all its expenses, including attorney's fees, incurred in any litigation in which it prevails either in whole or in part.

In TESTIMONY WHEREOF, the said PRINCIPAL and the said SURETY have caused this instrument to be signed by

their respective officers this \_\_\_\_\_ day of \_\_\_\_\_ A.D., \_\_\_\_\_ .

**PRINCIPAL**

**SURETY**

\_\_\_\_\_  
(Company Name)

\_\_\_\_\_  
(Company Name)

By \_\_\_\_\_  
(Signature & Title)

By: \_\_\_\_\_  
(Signature of Attorney-in-Fact)

**Notary Certification for Principal and Surety**

STATE OF ILLINOIS,  
County of \_\_\_\_\_

I, \_\_\_\_\_, a Notary Public in and for said County, do hereby certify that

\_\_\_\_\_ and \_\_\_\_\_  
(Insert names of individuals signing on behalf of PRINCIPAL & SURETY)

who are each personally known to me to be the same persons whose names are subscribed to the foregoing instrument on behalf of PRINCIPAL and SURETY, appeared before me this day in person and acknowledged respectively, that they signed and delivered said instrument as their free and voluntary act for the uses and purposes therein set forth.

Given under my hand and notarial seal this \_\_\_\_\_ day of \_\_\_\_\_ A.D. \_\_\_\_\_

My commission expires \_\_\_\_\_

\_\_\_\_\_  
Notary Public

In lieu of completing the above section of the Proposal Bid Form, the Principal may file an Electronic Bid Bond. By signing the proposal and marking the check box next to the Signature and Title line below, the Principal is ensuring the identified electronic bid bond has been executed and the Principal and Surety are firmly bound unto the State of Illinois under the conditions of the bid bond as shown above.

\_\_\_\_\_  
Electronic Bid Bond ID#

\_\_\_\_\_  
Company / Bidder Name



\_\_\_\_\_  
Signature and Title

**(1) Policy**

It is public policy that disadvantageded businesses as defined in 49 CFR Part 26 and the Special Provision shall have the maximum opportunity to participate in the performance of contracts financed in whole or in part with Federal or State funds. Consequently the requirements of 49 CFR Part 26 apply to this contract.

**(2) Obligation**

The contractor agrees to ensure that disadvantageded businesses as defined in 49 CFR Part 26 and the Special Provision have the maximum opportunity to participate in the performance of contracts or subcontracts financed in whole or in part with Federal or State funds. The contractor shall take all necessary and reasonable steps in accordance with 49 CFR Part 26 and the Special Provision to ensure that said businesses have the maximum opportunity to compete for and perform under this contract. The contractor shall not discriminate on the basis of race, color, national origin or sex in the award and performance of contracts.

**(3) Project and Bid Identification**

Complete the following information concerning the project and bid:

Route _____	Total Bid _____
Section _____	Contract DBE Goal _____ (Percent) _____ (Dollar Amount)
Project _____	
County _____	
Letting Date _____	
Contract No. _____	
Letting Item No. _____	

**(4) Assurance**

I, acting in my capacity as an officer of the undersigned bidder (or bidders if a joint venture), hereby assure the Department that on this project my company : (check one)

- Meets or exceeds contract award goals and has provided documented participation as follows:  
Disadvantaged Business Participation \_\_\_\_\_ percent

Attached are the signed participation statements, forms SBE 2025, required by the Special Provision evidencing availability and use of each business participating in this plan and assuring that each business will perform a commercially useful function in the work of the contract.

- Failed to meet contract award goals and has included good faith effort documentation to meet the goals and that my company has provided participation as follows:

Disadvantaged Business Participation \_\_\_\_\_ percent

The contract goals should be accordingly modified or waived. Attached is all information required by the Special Provision in support of this request including good faith effort. Also attached are the signed participation statements, forms SBE 2025, required by the Special Provision evidencing availability and use of each business participating in this plan and assuring that each business will perform a commercially useful function in the work of the contract.

\_\_\_\_\_  
Company

By \_\_\_\_\_

Title \_\_\_\_\_

Date \_\_\_\_\_

The "as read" Low Bidder is required to comply with the Special Provision.

Submit only one utilization plan for each project. The utilization plan shall be submitted in accordance with the special provision.

Bureau of Small Business Enterprises  
2300 South Dirksen Parkway  
Springfield, Illinois 62764

**Local Let Projects**  
Submit forms to the  
Local Agency



**Illinois Department  
of Transportation**

Subcontractor Registration \_\_\_\_\_

**Participation Statement**

(1) Instructions

This form must be completed for each disadvantaged business participating in the Utilization Plan. This form shall be submitted in accordance with the special provision and will be attached to the Utilization Plan form.. If additional space is needed complete an additional form for the firm.

(2) Work

Pay Item No.	Description	Quantity	Unit Price	Total
Total				

(3) Partial Payment Items

For any of the above items which are partial pay items, specifically describe the work and subcontract dollar amount:

(4) Commitment

The undersigned certify that the information included herein is true and correct, and that the DBE firm listed below has agreed to perform a commercially useful function in the work of the contract item(s) listed above and to execute a contract with the prime contractor. The undersigned further understand that no changes to this statement may be made without prior approval from the Department's Bureau of Small Business Enterprises and that complete and accurate information regarding actual work performed on this project and the payment therefore must be provided to the Department.

\_\_\_\_\_  
Signature for Prime Contractor

Title \_\_\_\_\_

Date \_\_\_\_\_

Contact \_\_\_\_\_

Phone \_\_\_\_\_

Firm Name \_\_\_\_\_

Address \_\_\_\_\_

City/State/Zip \_\_\_\_\_

\_\_\_\_\_  
Signature for DBE Firm

Title \_\_\_\_\_

Date \_\_\_\_\_

Contact Person \_\_\_\_\_

Phone \_\_\_\_\_

Firm Name \_\_\_\_\_

Address \_\_\_\_\_

City/State/Zip \_\_\_\_\_

E \_\_\_\_\_

WC \_\_\_\_\_

The Department of Transportation is requesting disclosure of information that is necessary to accomplish the statutory purpose as outlined under the state and federal law. Disclosure of this information is **REQUIRED**. Failure to provide any information will result in the contract not being awarded. This form has been approved by the State Forms Management Center.



# PROPOSAL ENVELOPE



# PROPOSALS

for construction work advertised for bids by the  
Illinois Department of Transportation

Item No.	Item No.	Item No.

Submitted By:

Name:
Address:
Phone No.

Bidders should use an IDOT proposal envelope or affix this form to the front of a 10" x 13" envelope for the submittal of bids. If proposals are mailed, they should be enclosed in a second or outer envelope addressed to:

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

## **NOTICE**

**Individual bids, including Bid Bond and/or supplemental information if required, should be securely stapled.**

# CONTRACTOR OFFICE COPY OF CONTRACT SPECIFICATIONS

## NOTICE

None of the following material needs to be returned with the bid package unless the special provisions require documentation and/or other information to be submitted.

**Contract No. 60W26  
COOK County  
Section 2013-008R  
Project ACNHPP-000S(947)  
Route FAI 90/94/290  
District 1 Construction Funds**



**Illinois Department of Transportation**

## **SUBCONTRACTOR DOCUMENTATION**

Public Acts 96-0795, 96-0920, and 97-0895 enacted substantial changes to the provisions of the Code (30 ILCS 500). Among the changes are provisions affecting subcontractors. The Contractor awarded this contract will be required as a material condition of the contract to implement and enforce the contract requirements applicable to subcontractors that entered into a contractual agreement with a total value of \$50,000 or more with a person or entity who has a contract subject to the Code and approved in accordance with article 108.01 of the Standard Specifications for Road and Bridge Construction.

If the Contractor seeks approval of subcontractors to perform a portion of the work, and approval is granted by the Department, the Contractor shall provide a copy of the subcontract to the Illinois Department of Transportation's CPO upon request within 15 calendar days after execution of the subcontract.

Financial disclosures required pursuant to Sec. 50-35 of the Code must be submitted for all applicable subcontractors. The subcontract shall contain the certifications required to be made by subcontractors pursuant to Article 50 of the Code. This Notice to Bidders includes a document incorporating all required subcontractor certifications and disclosures for use by the Contractor in compliance with this mandate. The document is entitled State Required Ethical Standards Governing Subcontractors.

## RETURN WITH SUBCONTRACT

### STATE ETHICAL STANDARDS GOVERNING SUBCONTRACTORS

Article 50 of the Code establishes the duty of all State CPOs, SPOs, and their designees to maximize the value of the expenditure of public moneys in procuring goods, services, and contracts for the State of Illinois and to act in a manner that maintains the integrity and public trust of State government. In discharging this duty, they are charged by law to use all available information, reasonable efforts, and reasonable actions to protect, safeguard, and maintain the procurement process of the State of Illinois.

The certifications hereinafter made by the subcontractor are each a material representation of fact upon which reliance is placed should the Department approve the subcontractor. The CPO may terminate or void the contract approval if it is later determined that the bidder or subcontractor rendered a false or erroneous certification. If a false certification is made by a subcontractor the contractor's submitted bid and the executed contract may not be declared void unless the contractor refuses to terminate the subcontract upon the State's request after a finding that the subcontractor's certification was false.

Section 50-2 of the Code provides that every person that has entered into a multi-year contract and every subcontractor with a multi-year subcontract shall certify, by July 1 of each fiscal year covered by the contract after the initial fiscal year, to the responsible CPO whether it continues to satisfy the requirements of Article 50 pertaining to the eligibility for a contract award. If a contractor or subcontractor is not able to truthfully certify that it continues to meet all requirements, it shall provide with its certification a detailed explanation of the circumstances leading to the change in certification status. A contractor or subcontractor that makes a false statement material to any given certification required under Article 50 is, in addition to any other penalties or consequences prescribed by law, subject to liability under the Whistleblower Reward and Protection Act for submission of a false claim.

#### **A. Bribery**

Section 50-5. Bribery.

(a) Prohibition. No person or business shall be awarded a contract or subcontract under this Code who:

(1) has been convicted under the laws of Illinois or any other state of bribery or attempting to bribe an officer or employee of the State of Illinois or any other state in that officer's or employee's official capacity; or

(2) has made an admission of guilt of that conduct that is a matter of record but has not been prosecuted for that conduct.

(b) Businesses. No business shall be barred from contracting with any unit of State or local government, or subcontracting under such a contract, as a result of a conviction under this Section of any employee or agent of the business if the employee or agent is no longer employed by the business and:

(1) the business has been finally adjudicated not guilty; or

(2) the business demonstrates to the governmental entity with which it seeks to contract, or which is signatory to the contract to which the subcontract relates, and that entity finds that the commission of the offense was not authorized, requested, commanded, or performed by a director, officer, or high managerial agent on behalf of the business as provided in paragraph (2) of subsection (a) of Section 5-4 of the Criminal Code of 2012.

(c) Conduct on behalf of business. For purposes of this Section, when an official, agent, or employee of a business committed the bribery or attempted bribery on behalf of the business and in accordance with the direction or authorization of a responsible official of the business, the business shall be chargeable with the conduct.

(d) Certification. Every bid submitted to and contract executed by the State, and every subcontract subject to Section 20-120 of the Code shall contain a certification by the contractor or the subcontractor, respectively, that the contractor or subcontractor is not barred from being awarded a contract or subcontract under this Section and acknowledges that the CPO may declare the related contract void if any certifications required by this Section are false. A contractor who makes a false statement, material to the certification, commits a Class 3 felony.

The contractor or subcontractor certifies that it is not barred from being awarded a contract under Section 50.5.

#### **B. Felons**

Section 50-10. Felons.

(a) Unless otherwise provided, no person or business convicted of a felony shall do business with the State of Illinois or any State agency, or enter into a subcontract, from the date of conviction until 5 years after the date of completion of the sentence for that felony, unless no person held responsible by a prosecutorial office for the facts upon which the conviction was based continues to have any involvement with the business.

(b) Certification. Every bid submitted to and contract executed by the State and every subcontract subject to Section 20-120 of the Code shall contain a certification by the bidder or contractor or subcontractor, respectively, that the bidder, contractor, or subcontractor is not barred from being awarded a contract or subcontract under this Section and acknowledges that the CPO may declare the related contract void if any of the certifications required by this Section are false.

**RETURN WITH SUBCONTRACT**

**C. Debt Delinquency**

Section 50-11 and 50-12. Debt Delinquency.

The contractor or bidder or subcontractor, respectively, certifies that it, or any affiliate, is not barred from being awarded a contract or subcontract under the Code. Section 50-11 prohibits a person from entering into a contract with a State agency, or entering into a subcontract, if it knows or should know that it, or any affiliate, is delinquent in the payment of any debt to the State as defined by the Debt Collection Board. Section 50-12 prohibits a person from entering into a contract with a State agency, or entering into a subcontract, if it, or any affiliate, has failed to collect and remit Illinois Use Tax on all sales of tangible personal property into the State of Illinois in accordance with the provisions of the Illinois Use Tax Act. The bidder or contractor or subcontractor, respectively, further acknowledges that the CPO may declare the related contract void if this certification is false or if the bidder, contractor, or subcontractor, or any affiliate, is determined to be delinquent in the payment of any debt to the State during the term of the contract.

**D. Prohibited Bidders, Contractors and Subcontractors**

Section 50-10.5 and 50-60(c). Prohibited bidders, contractors and subcontractors.

The bidder or contractor or subcontractor, respectively, certifies in accordance with 30 ILCS 500/50-10.5 that no officer, director, partner or other managerial agent of the contracting business has been convicted of a felony under the Sarbanes-Oxley Act of 2002 or a Class 3 or Class 2 felony under the Illinois Securities Law of 1953 or if in violation of Subsection (c) for a period of five years from the date of conviction. Every bid submitted to and contract executed by the State and every subcontract subject to Section 20-120 of the Code shall contain a certification by the bidder, contractor, or subcontractor, respectively, that the bidder, contractor, or subcontractor is not barred from being awarded a contract or subcontract under this Section and acknowledges that the CPO shall declare the related contract void if any of the certifications completed pursuant to this Section are false.

**E. Section 42 of the Environmental Protection Act**

The bidder or contractor or subcontractor, respectively, certifies in accordance with 30 ILCS 500/50-14 that the bidder, contractor, or subcontractor, is not barred from being awarded a contract or entering into a subcontract under this Section which prohibits the bidding on or entering into contracts with the State of Illinois or a State agency, or entering into any subcontract, that is subject to the Code by a person or business found by a court or the Pollution Control Board to have committed a willful or knowing violation of Section 42 of the Environmental Protection Act for a period of five years from the date of the order. The bidder or contractor or subcontractor, respectively, acknowledges that the CPO may declare the contract void if this certification is false.

**The undersigned, on behalf of the subcontracting company, has read and understands the above certifications and makes the certifications as required by law.**

<hr style="border: 0; border-top: 1px solid black; margin-bottom: 5px;"/> Name of Subcontracting Company		
<hr style="border: 0; border-top: 1px solid black; margin-bottom: 5px;"/> Authorized Officer	<hr style="border: 0; border-top: 1px solid black; margin-bottom: 5px;"/> Date	

**RETURN WITH SUBCONTRACT**  
**SUBCONTRACTOR DISCLOSURES**

**I. DISCLOSURES**

- A.** The disclosures hereinafter made by the subcontractor are each a material representation of fact upon which reliance is placed. The subcontractor further certifies that the Department has received the disclosure forms for each subcontract.

The CPO may void the bid, contract, or subcontract, respectively, if it is later determined that the bidder or subcontractor rendered a false or erroneous disclosure. A contractor or subcontractor may be suspended or debarred for violations of the Code. Furthermore, the CPO may void the contract.

**B. Financial Interests and Conflicts of Interest**

1. Section 50-35 of the Code provides that all subcontracts with a total value of \$50,000 or more, from subcontractors identified in Section 20-120 of the Code, shall be accompanied by disclosure of the financial interests of the subcontractor. This disclosed information for the subcontractor, will be maintained as public information subject to release by request pursuant to the Freedom of Information Act, filed with the Procurement Policy Board, and shall be incorporated as a material term of the Prime Contractor's contract. Furthermore, pursuant to this Section, the Procurement Policy Board may recommend to allow or void a contract or subcontract based on a potential conflict of interest.

The financial interests to be disclosed shall include ownership or distributive income share that is in excess of 5%, or an amount greater than 60% of the annual salary of the Governor, of the subcontracting entity or its parent entity, whichever is less, unless the subcontractor is a publicly traded entity subject to Federal 10K reporting, in which case it may submit its 10K disclosure in place of the prescribed disclosure. If a subcontractor is a privately held entity that is exempt from Federal 10K reporting, but has more than 200 shareholders, it may submit the information that Federal 10K companies are required to report, and list the names of any person or entity holding any ownership share that is in excess of 5%. The disclosure shall include the names, addresses, and dollar or proportionate share of ownership of each person making the disclosure, their instrument of ownership or beneficial relationship, and notice of any potential conflict of interest resulting from the current ownership or beneficial interest of each person making the disclosure having any of the relationships identified in Section 50-35 and on the disclosure form.

**The current annual salary of the Governor is \$177,412.00.**

In addition, all disclosures shall indicate any other current or pending contracts, subcontracts, proposals, leases, or other ongoing procurement relationships the subcontracting entity has with any other unit of state government and shall clearly identify the unit and the contract, subcontract, proposal, lease, or other relationship.

2. Disclosure Forms. Disclosure Form A is attached for use concerning the individuals meeting the above ownership or distributive share requirements. A separate Disclosure Form A must be submitted with the bid for each individual meeting the above requirements. In addition, a second form (Disclosure Form B) provides for the disclosure of current or pending procurement relationships with other (non-IDOT) state agencies and a total ownership certification. **The forms must be included with each bid.**

**C. Disclosure Form Instructions**

**Form A Instructions for Financial Information & Potential Conflicts of Interest**

If the subcontractor is a publicly traded entity subject to Federal 10K reporting, the 10K Report may be submitted to meet the requirements of Form A. If a subcontractor is a privately held entity that is exempt from Federal 10K reporting, but has more than 200 shareholders, it may submit the information that Federal 10K companies are required to report, and list the names of any person or entity holding any ownership share that is in excess of 5%. If a subcontractor is not subject to Federal 10K reporting, the subcontractor must determine if any individuals are required by law to complete a financial disclosure form. To do this, the subcontractor should answer each of the following questions. A "YES" answer indicates Form A must be completed. If the answer to each of the following questions is "NO", then the **NOT APPLICABLE STATEMENT** on the second page of Form A must be signed and dated by a person that is authorized to execute contracts for the subcontracting company. Note: These questions are for assistance only and are not required to be completed.

1. Does anyone in your organization have a direct or beneficial ownership share of greater than 5% of the bidding entity or parent entity? YES \_\_\_ NO \_\_\_
2. Does anyone in your organization have a direct or beneficial ownership share of less than 5%, but which has a value greater than 60% of the annual salary of the Governor? YES \_\_\_ NO \_\_\_
3. Does anyone in your organization receive more than 60% of the annual salary of the Governor of the subcontracting entity's or parent entity's distributive income? YES \_\_\_ NO \_\_\_

(Note: Distributive income is, for these purposes, any type of distribution of profits. An annual salary is not distributive income.)

4. Does anyone in your organization receive greater than 5% of the subcontracting entity's or parent entity's total distributive income, but which is less than 60% of the annual salary of the Governor? YES \_\_\_ NO \_\_\_

(Note: Only one set of forms needs to be completed per person per subcontract even if a specific individual would require a yes answer to more than one question.)

A "YES" answer to any of these questions requires the completion of Form A. The subcontractor must determine each individual in the subcontracting entity or the subcontracting entity's parent company that would cause the questions to be answered "Yes". Each form must be signed and dated by a person that is authorized to execute contracts for your organization. **Photocopied or stamped signatures are not acceptable.** The person signing can be, but does not have to be, the person for which the form is being completed. The subcontractor is responsible for the accuracy of any information provided.

If the answer to each of the above questions is "NO", then the **NOT APPLICABLE STATEMENT** on page 2 of Form A must be signed and dated by a person that is authorized to execute contracts for your company.

## RETURN WITH SUBCONTRACT

### **Form B: Instructions for Identifying Other Contracts & Procurement Related Information**

Disclosure Form B must be completed for each subcontract submitted by the subcontracting entity. *Note: Checking the NOT APPLICABLE STATEMENT on Form A does not allow the subcontractor to ignore Form B. Form B must be completed, checked, and dated or the subcontract will not be approved.*

The Subcontractor shall identify, by checking Yes or No on Form B, whether it has any pending contracts, subcontracts, leases, bids, proposals, or other ongoing procurement relationship with any other (non-IDOT) State of Illinois agency. If "No" is checked, the subcontractor only needs to complete the check box on the bottom of Form B. If "Yes" is checked, the subcontractor must list all non-IDOT State of Illinois agency pending contracts, subcontracts, leases, bids, proposals, and other ongoing procurement relationships. These items may be listed on Form B or on an attached sheet(s). Contracts with cities, counties, villages, etc. are not considered State of Illinois agency contracts and are not to be included. Contracts or subcontracts with other State of Illinois agencies such as the Department of Natural Resources or the Capital Development Board must be included.

ILLINOIS DEPARTMENT OF TRANSPORTATION

Form A Subcontractor: Financial Information & Potential Conflicts of Interest Disclosure

Subcontractor Name, Legal Address, City, State, Zip, Telephone Number, Email Address, Fax Number (if available)

Disclosure of the information contained in this Form is required by the Section 50-35 of the Code (30 ILCS 500). Subcontractors desiring to enter into a subcontract of a State of Illinois contract must disclose the financial information and potential conflict of interest information as specified in this Disclosure Form.

The current annual salary of the Governor is \$177,412.00.

DISCLOSURE OF FINANCIAL INFORMATION

1. Disclosure of Financial Information. The individual named below has an interest in the SUBCONTRACTOR (or its parent) in terms of ownership or distributive income share in excess of 5%, or an interest which has a value of more than 60% of the annual salary of the Governor.

FOR INDIVIDUAL (type or print information) NAME: ADDRESS Type of ownership/distributable income share: stock sole proprietorship Partnership other: (explain on separate sheet): % or \$ value of ownership/distributable income share:

2. Disclosure of Potential Conflicts of Interest. Check "Yes" or "No" to indicate which, if any, of the following potential conflict of interest relationships apply. If the answer to any question is "Yes", please attach additional pages and describe.

(a) State employment, currently or in the previous 3 years, including contractual employment of services. Yes \_\_\_ No \_\_\_

If your answer is yes, please answer each of the following questions.

1. Are you currently an officer or employee of either the Capitol Development Board or the Illinois State Toll Highway Authority? Yes \_\_\_ No \_\_\_

2. Are you currently appointed to or employed by any agency of the State of Illinois? If you are currently appointed to or employed by any agency of the State of Illinois, and your annual salary exceeds 60% of the annual salary of the Governor, provide the name the State agency for which you are employed and your annual salary.



**RETURN WITH SUBCONTRACT**

3. If you are currently appointed to or employed by any agency of the State of Illinois, and your annual salary exceeds 60% of the annual salary of the Governor, are you entitled to receive (i) more than 7 1/2% of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess of 100% of the annual salary of the Governor?  
Yes \_\_\_ No \_\_\_

4. If you are currently appointed to or employed by any agency of the State of Illinois, and your annual salary exceeds 60% of the annual salary of the Governor, are you and your spouse or minor children entitled to receive (i) more than 15 % in the aggregate of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess of two times the salary of the Governor?  
Yes \_\_\_ No \_\_\_

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(b) State employment of spouse, father, mother, son, or daughter, including contractual employment services in the previous 2 years.

Yes \_\_\_ No \_\_\_

If your answer is yes, please answer each of the following questions.

1. Is your spouse or any minor children currently an officer or employee of the Capitol Development Board or the Illinois State Toll Highway Authority?  
Yes \_\_\_ No \_\_\_

2. Is your spouse or any minor children currently appointed to or employed by any agency of the State of Illinois? If your spouse or minor children is/are currently appointed to or employed by any agency of the State of Illinois, and his/her annual salary exceeds 60% of the annual salary of the Governor, provide the name of your spouse and/or minor children, the name of the State agency for which he/she is employed and his/her annual salary. \_\_\_\_\_

3. If your spouse or any minor children is/are currently appointed to or employed by any agency of the State of Illinois, and his/her annual salary exceeds 60% of the annual salary of the Governor, are you entitled to receive (i) more than 7 1/2% of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess of 100% of the annual salary of the Governor?  
Yes \_\_\_ No \_\_\_

4. If your spouse or any minor children are currently appointed to or employed by any agency of the State of Illinois, and his/her annual salary exceeds 60% of the annual salary of the Governor, are you and your spouse or minor children entitled to receive (i) more than 15 % in the aggregate of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess of two times the salary of the Governor?  
Yes \_\_\_ No \_\_\_

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(c) Elective status; the holding of elective office of the State of Illinois, the government of the United States, any unit of local government authorized by the Constitution of the State of Illinois or the statutes of the State of Illinois currently or in the previous 3 years.  
Yes \_\_\_ No \_\_\_

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(d) Relationship to anyone holding elective office currently or in the previous 2 years; spouse, father, mother, son, or daughter.  
Yes \_\_\_ No \_\_\_

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(e) Appointive office; the holding of any appointive government office of the State of Illinois, the United States of America, or any unit of local government authorized by the Constitution of the State of Illinois or the statutes of the State of Illinois, which office entitles the holder to compensation in excess of the expenses incurred in the discharge of that office currently or in the previous 3 years.  
Yes \_\_\_ No \_\_\_

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(f) Relationship to anyone holding appointive office currently or in the previous 2 years; spouse, father, mother, son, or daughter.  
Yes \_\_\_ No \_\_\_

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(g) Employment, currently or in the previous 3 years, as or by any registered lobbyist of the State government.  
Yes \_\_\_ No \_\_\_

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**RETURN WITH SUBCONTRACT**

(h) Relationship to anyone who is or was a registered lobbyist in the previous 2 years; spouse, father, mother, son, or daughter. Yes \_\_\_ No \_\_\_

(i) Compensated employment, currently or in the previous 3 years, by any registered election or reelection committee registered with the Secretary of State or any county clerk of the State of Illinois, or any political action committee registered with either the Secretary of State or the Federal Board of Elections. Yes \_\_\_ No \_\_\_

(j) Relationship to anyone; spouse, father, mother, son, or daughter; who was a compensated employee in the last 2 years by any registered election or re-election committee registered with the Secretary of State or any county clerk of the State of Illinois, or any political action committee registered with either the Secretary of State or the Federal Board of Elections. Yes \_\_\_ No \_\_\_

**3 Communication Disclosure.**

Disclose the name and address of each lobbyist and other agent of the bidder or offeror who is not identified in Section 2 of this form, who is has communicated, is communicating, or may communicate with any State officer or employee concerning the bid or offer. This disclosure is a continuing obligation and must be promptly supplemented for accuracy throughout the process and throughout the term of the contract. If no person is identified, enter "None" on the line below:

Name and address of person(s): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**RETURN WITH SUBCONTRACT**

**4. Debarment Disclosure.** For each of the persons identified under Sections 2 and 3 of this form, disclose whether any of the following has occurred within the previous 10 years: debarment from contracting with any governmental entity; professional licensure discipline; bankruptcies; adverse civil judgments and administrative findings; and criminal felony convictions. This disclosure is a continuing obligation and must be promptly supplemented for accuracy throughout the procurement process and term of the contract. If no person is identified, enter "None" on the line below:

Name of person(s): \_\_\_\_\_

Nature of disclosure: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**APPLICABLE STATEMENT**

**This Disclosure Form A is submitted on behalf of the INDIVIDUAL named on previous page. Under penalty of perjury, I certify the contents of this disclosure to be true and accurate to the best of my knowledge.**

Completed by:  \_\_\_\_\_ Date \_\_\_\_\_  
Signature of Individual or Authorized Officer

**NOT APPLICABLE STATEMENT**

**Under penalty of perjury, I have determined that no individuals associated with this organization meet the criteria that would require the completion of this Form A.**

**This Disclosure Form A is submitted on behalf of the SUBCONTRACTOR listed on the previous page.**

\_\_\_\_\_ Date \_\_\_\_\_  
Signature of Authorized Officer

RETURN WITH SUBCONTRACT

ILLINOIS DEPARTMENT OF TRANSPORTATION

Form B
Subcontractor: Other Contracts & Financial Related Information Disclosure

Form with fields: Subcontractor Name, Legal Address, City, State, Zip, Telephone Number, Email Address, Fax Number (if available)

Disclosure of the information contained in this Form is required by the Section 50-35 of the Code (30 ILCS 500). This information shall become part of the publicly available contract file.

DISCLOSURE OF OTHER CONTRACTS, SUBCONTRACTS, AND PROCUREMENT RELATED INFORMATION

1. Identifying Other Contracts & Procurement Related Information. The SUBCONTRACTOR shall identify whether it has any pending contracts, subcontracts, including leases, bids, proposals, or other ongoing procurement relationship with any other State of Illinois agency: Yes \_\_\_ No \_\_\_

If "No" is checked, the subcontractor only needs to complete the signature box on the bottom of this page.

2. If "Yes" is checked. Identify each such relationship by showing State of Illinois agency name and other descriptive information such as bid or project number (attach additional pages as necessary). SEE DISCLOSURE FORM INSTRUCTIONS:

THE FOLLOWING STATEMENT MUST BE CHECKED

Signature box with fields for Signature of Authorized Officer and Date

OWNERSHIP CERTIFICATION

Please certify that the following statement is true if the individuals for all submitted Form A disclosures do not total 100% of ownership

Any remaining ownership interest is held by individuals receiving less than \$106,447.20 of the bidding entity's or parent entity's distributive income or holding less than a 5% ownership interest.

Yes No N/A (Form A disclosure(s) established 100% ownership)



## NOTICE TO BIDDERS

- 1. TIME AND PLACE OF OPENING BIDS.** Sealed proposals for the improvement described herein will be received by the Department of Transportation. Electronic bids are to be submitted to the electronic bidding system (ics-Integrated Contractors Exchange). Paper-based bids are to be submitted to the Chief Procurement Officer for the Department of Transportation in care of the Chief Contracts Official at the Harry R. Hanley Building, 2300 South Dirksen Parkway, in Springfield, Illinois until 10:00 o'clock a.m. November 8, 2013. All bids will be gathered, sorted, publicly opened and read in the auditorium at the Department of Transportation's Harry R. Hanley Building shortly after the 10:00 a.m. cut off time.
- 2. DESCRIPTION OF WORK.** The proposed improvement is identified and advertised for bids in the Invitation for Bids as:

**Contract No. 60W26  
COOK County  
Section 2013-008R  
Project ACNHPP-000S(947)  
Route FAI 90/94/290  
District 1 Construction Funds**

**Bridge removal and replacement, approach roadway construction and resurfacing underpass and roadway lighting on the Halsted St. and West Harrison Bridges canopy construction on Halsted St. near CTA station and new traffic signals, all located along I-90/24/290 from Circle Interchanges to Halston St. Bridge and Harrison St. Bridge in Chicago.**

- 3. INSTRUCTIONS TO BIDDERS.** (a) This Notice, the invitation for bids, proposal and letter of award shall, together with all other documents in accordance with Article 101.09 of the Standard Specifications for Road and Bridge Construction, become part of the contract. Bidders are cautioned to read and examine carefully all documents, to make all required inspections, and to inquire or seek explanation of the same prior to submission of a bid.  
  
(b) State law, and, if the work is to be paid wholly or in part with Federal-aid funds, Federal law requires the bidder to make various certifications as a part of the proposal and contract. By execution and submission of the proposal, the bidder makes the certification contained therein. A false or fraudulent certification shall, in addition to all other remedies provided by law, be a breach of contract and may result in termination of the contract.
- 4. AWARD CRITERIA AND REJECTION OF BIDS.** This contract will be awarded to the lowest responsive and responsible bidder considering conformity with the terms and conditions established by the Department in the rules, Invitation for Bids and contract documents. The issuance of plans and proposal forms for bidding based upon a prequalification rating shall not be the sole determinant of responsibility. The Department reserves the right to determine responsibility at the time of award, to reject any or all proposals, to readvertise the proposed improvement, and to waive technicalities.

By Order of the  
Illinois Department of Transportation

Ann L. Schneider,  
Secretary

INDEX  
FOR  
Supplemental SPECIFICATIONS  
AND RECURRING SPECIAL PROVISIONS

Adopted January 1, 2013

This index contains a listing of SUPPLEMENTAL SPECIFICATIONS, frequently used RECURRING SPECIAL PROVISIONS, and LOCAL ROADS AND STREETS RECURRING SPECIAL PROVISIONS.

ERRATA            Standard Specifications for Road and Bridge Construction (Adopted 1-1-12) (Revised 1-1-13)

SUPPLEMENTAL SPECIFICATIONS

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1101 General Equipment	32
1106 Work Zone Traffic Control Devices	34

RECURRING SPECIAL PROVISIONS

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

CHECK SHEET #		PAGE NO.
1	X Additional State Requirements for Federal-Aid Construction Contracts (Eff. 2-1-69) (Rev. 1-1-10)	35
2	X Subletting of Contracts (Federal-Aid Contracts) (Eff. 1-1-88) (Rev. 5-1-93)	38
3	X EEO (Eff. 7-21-78) (Rev. 11-18-80)	39
4	Specific Equal Employment Opportunity Responsibilities Non Federal-Aid Contracts (Eff. 3-20-69) (Rev. 1-1-94)	49
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15	PCC Partial Depth Hot-Mix Asphalt Patching (Eff. 1-1-98) (Rev. 1-1-07)	77
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**STATE OF ILLINOIS**

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**SPECIAL PROVISIONS**

The following Special Provisions supplement the "Standard Specifications for Road and Bridge Construction" adopted January 1, 2012, the latest edition of the "Manual of Uniform Traffic Control Devices for Streets and Highways, the "Manual of Test Procedures for Materials" in effect on the date of invitation for bids, and the Supplemental Specifications and Recurring Special Provisions indicated on the Check Sheets included herein which apply to and govern the construction of FAI 90/94/290(I-90/94/290), Project ACNHPP-005(947), Section 2013-008R, in Cook County, Contract 60W26, and in case of conflict with any part or parts of said specifications, the said special provisions shall take precedence and shall govern.

**LOCATION OF PROJECT**

The project is located along Harrison Street from west of Halsted Street to east of SB 90/94 and along Halsted Street from south of Harrison Street to Van Buren Street. The gross and net length of the project is 1,674.04 Feet (0.319 miles).

**DESCRIPTION OF PROJECT**

The work consists of the reconstruction of the Harrison Street Bridge (SN 016-1713) over southbound interstate 90/94 from Halsted Street to east of SB 90/94, Halsted Street Bridge (SN 016-1716) over interstate 290 and the CTA from south of Harrison Street to Van Buren Street and proposed retaining wall 13 (SN 016-1802) at the southwest quadrant connecting to the proposed west abutment of Harrison Street. Also included in the work is the intersection at Halsted Street and Harrison Street and widening of Ramp ES to replace the existing pavement section once the proposed pier is built within the existing ramp. The work also includes erection of a canopy spanning the center of the Halsted Street. Bridge and integrated with the entrance to the UIC – Halsted Street Blue line CTA Station.

Work includes bridge reconstruction, roadway reconstruction, erosion control and protection, utility relocation of existing storm sewers and existing water main, special waste excavation, temporary ramp pavement for the ramp and I-90/94, earth excavation and embankment, removal of existing improvements, new storm and combined sewers, curb and gutters, pavements, sidewalks, pavement marking and signage, roadway lighting, retaining wall, concrete abutments, steel furnishing and erection, bridge deck and railings, fabrication, installation and painting of the canopy, traffic control and protection, traffic signals, urban enhancements and all incidental and collateral work necessary to complete the improvements as shown on the Plans and as described herein.

Work By Others:

- Utilities: Utility relocations and adjustments (by others). Reference STATUS OF UTILITIES TO BE ADJUSTED for additional information.
- CTA: CTA flagging and coordination. Reference CTA FLAGGING AND COORDINATION for additional information

**SOILS INFORMATION**

Soil boring logs and generalized soil profiles are shown in the Plans for Harrison Street and Halsted Street.

The reports below are available for inspection at IDOT District 1, 201 W. Center Court, Schaumburg, Illinois.

Structure Geotechnical Report

Performed for Harrison Street Bridge Over Southbound Interstate 90/94

SN 016-1713, Section 2013-008R

IDOT D-91-227-13, PTB 163/ITEM 001

Cook County, Illinois

Prepared by:

Wang Engineering, Inc.

April 04, 2013

Structure Geotechnical Report

Performed for Halsted Street Bridge Over Interstate 290 and the CTA

Existing SN 016-2081, Proposed SN 016-1716, Section 2013-009R

IDOT D-91-227-13, PTB 163/ITEM 001

Cook County, Illinois

Prepared by:

Wang Engineering, Inc.

April 15, 2013

## **CONTRACTOR COOPERATION**

The Contractor's attention is directed to the fact that other separate contracts may be under construction during the duration of this Contract. Adjacent contracts may consist of, but are not limited to projects near:

- Contract 60X27 – Halsted/Harrison St Watermain Materials Procurement (Circle Interchange)
- Contract 60F63 - FAI 90/94 (Kennedy Expressway) at Ohio Street
- Contract 60W36 – Tunnel Bulkheading (Circle Interchange)
- Contract 60W25 – Morgan Street Bridge at I-290 / Congress Pkwy (Circle Interchange)
- Contract 60W29 – Peoria Street Bridge at I-290 / Congress Pkwy (Circle Interchange)
- Contract 60W71 – Harrison Street Bridge (East) at I-90/94 (Circle Interchange)
- And others.

The Contractor will be governed by Article 105.08 of the Standard Specifications.

The Contractor will coordinate proposed project start dates and sequence of construction with the Engineer and other Contractors to present an effective and timely schedule for successful completion of the project.

The work included within 60W36 to bulkhead and fill water tunnels below Halsted Street and Harrison Street is required to be complete prior to the start of foundation work for new substructure elements of both the Harrison Street Bridge and the West Harrison Street Bridge. Contractor cannot begin foundation work prior to written authorization from the Engineer that the work under 60W36 has been completed and accepted by the Department.

## **PROGRESS SCHEDULE**

Description. Time is of the essence in this Contract. It may be necessary for the Contractor to work longer hours, use additional crews, and work during weekends in order to complete the work within the required time limit. The Contractor shall submit a Critical Path Method (CPM) Progress Schedule as described below for the Engineer's approval before the work can be started.

The Contractor will not be allowed any compensation for working longer hours or using extra shifts; and working on weekends or during Holidays; working during winter months, etc. to meet the specified Completion Date.

This work shall consist of preparing, revising and updating a detailed progress scheduled based upon the Critical Path Method (CPM). This work shall also consist of performing time impact analysis of the progress schedule based upon the various revisions and updates as they occur.

Requirements. The software shall produce an electronic progress schedule for submission to the department that is 100% compatible with Primavera SureTrak 3.0 Project Manager, published by Primavera Systems, Inc.

Format. The electronic schedule format shall contain the following:

- a. Project Name: (Optional).
- b. Template: Construction.
- c. Type: SureTrak: Native file format for stand-alone contracts.
- d. Planning Unit: Days (calendar working).
- e. Number/Version: Original or updated number.
- f. Start Date: Not later than ten days after execution of the contract.
- g. Must Finish Date: Completion date for completion date contracts.
- h. Project Title: Contract number.
- i. Company Name: Contractor's name.

Calendars.

- a. Completion Date Contracts. The base calendar shall show the proposed working days of the week and the proposed number of work hours per day.

Schedule Development. The detailed schedule shall incorporate the entire contract time. The minimum number of activities shown on the schedule shall represent the work incorporating the pay items whose aggregate contract value constitutes 80 percent of the total contract value. These pay items shall be determined by starting with the pay item with the largest individual contract value and adding subsequent pay item contract values in descending order until 80 percent of the contract value has been attained. Any additional activities required to maintain the continuity of the schedule logic shall also be shown.

The following shall be depicted in the schedule for each activity:

- a. Activity Identification (ID) Numbers. The Contract shall utilize numerical designations to identify each activity. Numbering of activities shall be in increments of not less than ten digits.
- b. A description of the work represented by the activity (maximum forty-five characters). The use of descriptions referring to a percentage of a multi-element item (i.e., construct deck 50%) shall not be used. Separate activities shall be included to represent different elements of multi-element items (i.e., forms, reinforcing, concrete, etc.). Multiple activities with the same work description shall include a location as part of the description.

- c. Proposed activity duration shall be shown in whole days. The Contractor shall provide production rates to justify the activity duration. Schedule duration shall be contiguous and not interruptible.

The schedule shall indicate the sequence and interdependence of activities required for the prosecution of the work. The schedule logic shall not be violated.

Activities should be broken down such that each activity encompasses a single operation or tightly-integrated operations in a single, contiguous and continuous area of the project, with no activity exceeding \$200,000 without the consent of the Engineer.

Total Float shall be calculated as finish float. The schedule shall be calculated using retained logic. The Contractor shall not sequester float by calendar manipulations or extended duration. Float is not for the exclusive use or benefit of either the Department or the Contractor.

#### Tabular Reports.

- a. The following tabular reports will be required with each schedule submission:
  1. Classic Gantt
  2. Pert with Time Scale
- b. The heading of each tabular report shall include, but not be limited to, the project name, contract number, Contractor name, report date, data date, report title and page number.
- c. Each of the tabular reports shall also contain the following minimum information for each activity.
  1. Activity ID
  2. Activity Description
  3. Original Duration (calendar day/working day)
  4. Remaining Duration (calendar day/working day)
  5. Activity Description
  6. Early Start Date
  7. Late Start Date
  8. Early Finish Date
  9. Late Finish Date
  10. Percent Complete

11. Total Float

12. Calendar ID

13. Work performed by DBE Subcontractors and Trainees shall be shown in the Gantt Report.

d. Reports shall be printed in color on 11 in. x 17 in. (minimum) size sheets. The Classic Gantt shall show all columns, bars, column headings at the top, time scale at the top and shall show relationships.

Submission Requirements. The initial schedule shall be submitted prior to starting work but no later than five calendar days after execution of the contract. Updated schedules shall be submitted according to Article 108.02 except that as a minimum, updated schedules will be required at the 25, 50, and 75 percent completion points of the contract.

Updating.

- a. The Contractor shall not make any changes to the original duration, activity relationships, constraints, costs, add or delete activities, or alter the schedule's logic when updating the schedule.
- b. The originally approved baseline CPM schedule will be designated as the "Target Schedule" and shall only be changed based on a Change Order that extends the Contract duration. All updates will be plotted against the "Target Schedule." If the Contractor believes any such changes result in an overall increase in the contract time, the Contractor will immediately submit a request for extension of time along with the changed progress schedule and a detailed justification for the time extension request in accordance with Article 108.08.
- c. The updated information will include the original schedule detail and the following additional information:
  1. Actual start dates
  2. Actual finish dates
  3. Activity percent completion
  4. Remaining duration of activities in progress
  5. Identified or highlighted critical activities
- d. The Contractor shall submit scheduling documents in the same formats and number as indicated in this section.
- e. The Engineer shall withhold progress payments if the Contractor does not submit scheduled updates as required.

- f. Upon receipt of the CPM schedule update, the Engineer will review the schedule for conformance with the Contract Documents and degree of detail. The Engineer, within fourteen (14) Days after receipt of the Updated CPM Schedule and supporting documents, will approve or reject it with written comments. If the Updated CPM schedule is rejected, the Contractor must submit a Revised Updated CPM Schedule within seven (7) Days after the date of rejection.
- g. The updated progress schedule must accurately represent the Project's current status.

#### Contractor Changes to the Schedule.

The Contractor shall comply with the following requirements regarding proposed changes to the approved baseline CPM schedule:

- a. If the Contractor proposes to make any changes in the approved baseline CPM schedule, the Contractor shall notify the Engineer in writing, stating the reasons for the change, identifying each changed activity (including duration and interrelationships between activities) and providing a diskette of the proposed changed schedule. Every effort must be made by the Contractor to retain the original Activity ID numbers.
- b. The Engineer has the authority to approve or disapprove the proposed change in the baseline CPM schedule and shall do so in writing within ten (10) Days after receipt to the Contractor's submission.
- c. If the Engineer approves the change in the baseline. All monthly updates will be plotted against the new "Target Schedule".
- d. If the Engineer approves a portion of the change to the baseline CPM schedule, the Contractor shall submit a revised CPM schedule incorporating such change(s) within ten (10) Days after approval along with a written description of the change(s) to the schedule.

#### Recovery Schedule.

- a. The Contractor shall maintain an adequate work force and the necessary materials, supplies and equipment to meet the current approved baseline CPM schedule. In the event that the Contractor, in the judgment of the Engineer, is failing to meet the approved CPM schedule including any Contract milestones, the Contractor shall submit a recovery schedule.
- b. The recovery schedule shall set forth a plan to eliminate the schedule slippage (negative float). The plan must be specific to show the methods to achieve the recovery of time, i.e. increasing manpower, working overtime, weekend work, employing multiple shifts. All costs associated with implementing the recovery schedule shall be borne by the Contractor.

- c. Upon receipt of the CPM recovery schedule, the Engineer will review the schedule for conformance with the Contract Documents and degree of detail. The Engineer will approve the schedule or reject it with written comments within fourteen (14) Days of receipt of the recovery schedule and supporting documents. If the detailed CPM recovery schedule is rejected, the Contractor must submit a revised CPM recovery schedule within seven (7) Days of the date of rejection.

#### Revised Schedule.

The Engineer may direct the Contractor to revise the approved CPM schedule. Reasons for such direction may include, but are limited to, the following: (1) changes in the Work, (2) rephrasing of the Project or any phase, (3) a change in the duration of the Project or phase, and (4) acceleration of the Project or phase.

- a. The Engineer will direct the Contractor to provide a revised CPM schedule in writing.
- b. The Contractor will provide the revised CPM schedule within ten (10) Days of receipt of the Engineer's written direction.
- c. The Engineer has the authority, in its sole discretion, to approve or reject the revised CPM schedule and will do so in writing within ten (10) Days after receipt of the Contractor's submission. If the Engineer approves the revised schedule, such schedule will be designated the new "Target Schedule".

The schedule shall be submitted in the Sorted by Activity Layout (SORT4). The activities on the schedule shall be plotted using early start, late start, early finish, late finish and total finish.

For every schedule submission, the Contractor shall submit to the Engineer, four Windows XP compatible compact disks of all schedule data. Included on the disks shall be all of the tabular and graphic reports, network diagrams and bar chart data. Two copies shall be submitted on CD/R disks and two copies shall be submitted on CDD/RW disks. In addition, four plots of the CD/R disks will be approved initial or revised progress schedule for the contract. The approval will be documented by the Engineer on a corresponding plot of the schedule and returned to the Contractor.

Four copies of each schedule submission shall be printed in color on 11 in. x 17 in. (minimum) size sheets showing all columns, bars, column headings at the top, time scale at the top and showing relationships.

The schedule shall indicate the critical path to contract completion. Only one controlling item shall be designated at any point in time on the schedule.



Acceptance or approval of any progress schedule by the Engineer shall not be construed to imply approval of any particular method of construction, sequence of construction, any implied or stated rate of production. Acceptance will not act as a waiver of the obligation of the Contractor to complete the work in accordance with the contract proposal, Plans and Specifications, modify any rights or obligations of the Department as set forth in the contract, nor imply any obligation of a third party. Acceptance shall not be construed to modify or amend the contract or the time limit(s) therein. Acceptance shall not relieve the Contractor of the responsibility for the accuracy of any of the information included on the schedule. Failure of the Contractor to include in the schedule any element of work required for the performance of the contract, any sequence of work required by the contract, or any known or anticipated condition affecting the work shall not excuse the Contractor from completing all work required within the time limit(s) specified in the contract notwithstanding acceptance of the schedule by the Engineer.

Basis of Payment. This work will not be paid for separately, but shall be considered as included in the costs of the various items of work in the contract.

#### **WINTER WORK**

No adjustment will be made in the contract unit prices for any concrete if winter work is necessary to meet the required completion dates specified in the contract.

#### **RESTRICTION ON WORKING DAYS AFTER A COMPLETION DATE**

All temporary lane closures *on arterial streets* during the period governed by working days after a completion date will not be permitted during the hours of 6:00 a.m. to 9:00 a.m. and 3:00 p.m. to 6:00 p.m. Monday through Friday.

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

## **FAILURE TO COMPLETE THE WORK ON TIME**

Should the Contractor fail to complete the work on or before the completion date as specified in the Special Provision for "Completion Date Plus Working Days", or within such extended time as may have been allowed by the Department, the Contractor shall be liable to the Department in the amount of **\$ 2,300**, not as a penalty but as liquidated damages, for each calendar day or a portion thereof of overrun in the contract time or such extended time as may have been allowed.

The Contractor shall be liable to the Department in the amount of **\$10,000**, not as a penalty but as liquidated damages, for each calendar day or a portion thereof of overrun in the contract time or such extended time as may have been allowed for failing to complete the work on or before the interim completion date as specified in the Special Provision for "Completion Date Plus Working Days."

In fixing the damages as set out herein, the desire is to establish a certain mode of calculation for the work since the Department's actual loss, in the event of delay, cannot be predetermined, would be difficult of ascertainment, and a matter of argument and unprofitable litigation. This said mode is an equitable rule for measurement of the Department's actual loss and fairly takes into account the loss of use of the roadway if the project is delayed in completion. The Department shall not be required to provide any actual loss in order to recover these liquidated damages provided herein, as said damages are very difficult to ascertain. Furthermore, no provision of this clause shall be construed as a penalty, as such is not the intention of the parties.

A calendar day is every day shown on the calendar and starts at 12:00 midnight and ends at the following 12:00 midnight, twenty-four hours later.

## **COMPLETION DATE PLUS WORKING DAYS**

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

"When a completion date plus working days is specified, the Contractor shall complete all contract items and safely open all roadways to traffic by 11:59 PM on April 30, 2015 except as specified herein.

"All the work consisting of water main relocation must be completed and operational on or before May 1, 2014."

"All the work consisting of West Harrison Bridge (SN 016-1713) construction must be completed and safely open to traffic accessing the Cermak Pumping Station on or before August 1, 2014."

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

Article 108.09 or the Special Provision for "Failure to Complete the Work on Time", if included in this contract, shall apply to both the completion date and the number of working days.

## **SUBMITTALS**

There are elements of construction that may require long lead times between order and delivery to the project site for installation. The Contractor must prioritize timely submittals of shop drawings to minimize any delays in project execution.

Shop drawings for structural steel that is required to be galvanized must be submitted within one (1) week of the award. The submittal must be complete and include information on the steel as well as materials and processes proposed for galvanization. No additional compensation and no extension of calendar days will be made due to delays in receiving structural steel to the project area because of incomplete or delayed shop drawing submittals.

Shop drawings for structures, thrust restraints and other items for the construction of the the 54" water main relocation, 60" combined sewer relocation and sewer items along Harrison Street in front of the Cermak Pumping Station must be provided in a timely fashion due to limited period of time to perform work during the shutdown period of the Cermak Pumping Station or portions of the feeder water mains exiting the Cermak Pumping Station.

The Contractor shall provide notice to the Engineer concerning shop drawing submittal schedules and when shop drawing submittal deadlines may be delayed.

**STATUS OF UTILITIES TO BE ADJUSTED**

Effective: January 30, 1987

Revised: January 24, 2013

Utility companies involved in this project have provided the following estimated durations:

NAME OF UTILITY	TYPE	LOCATION	Estimated Duration of Time for the Completion of Relocation or Adjustments
ComEd	Electric	Currently located along east portion of Halsted Street to pier to north of I-290	The ComEd Line(s) appears only to serve the IDOT ITS Hub, which will require a temporary feed. The temporary feed is expected to be active in advance of bridge reconstruction.
ComEd	Electric	Currently located along east portion of Halsted Street between Van Buren Street and South of Harrison Street	ComEd has identified that ComEd will move existing lines temporarily into AT&T ducts on west portion of the bridge in advance of bridge reconstruction. After the completion of the east portion of the reconstructed bridge and after the proposed ComEd ducts are installed and connected along the east portion of the reconstructed bridge, ComEd will move lines from their temporary location along the west portion of Halsted Street to the proposed ducts. ComEd has indicated that the relocation of lines from the temporary location on the west to the permanent location on the east will take approximately one to two (1-2) weeks. During that period, the existing AT&T ducts on the west portion of the bridge must remain. No demolition of the west portion of the bridge will be allowed until ComEd has vacated the AT&T ducts.

ComEd	Electric	Currently located along south portion of Harrison Street	ComEd has indicated that all conduits will be vacated prior to construction. Lines will be relocated into the large duct package to the north of Harrison. Feed to Cermak Pumping Station will be made from east during construction. ComEd//Contractor will construct new ducts in similar area for future use. ComEd will construct new ducts in pavement leading to the bridge crossing, intercepting existing the existing ducts. ComEd is expected to begin cable placement after the Contractor has completed the proposed Harrison Street bridge, but before the Contractor has completed all work.
ComEd	Electric	Duct package north of Harrison	ComEd maintains a large package of major feeds that must not be disturbed during construction without ComEd involvement. Retaining wall Structure 016-1802 will be constructed over/around the ductbank. The exact location and depth of the duct has not been determined. Exploration to this date has only included methods that have not included physical location of the concrete encased duct. ComEd may utilize exploratory excavation to identify the exact location of the duct prior to construction. If that location conflicts with proposed current or future improvements, ComEd is expected to lower the portion of the ductbank to avoid any redesigned portions of the retaining wall. If ComEd has not located the ductbank prior to construction, the Contractor must install drilled shaft foundations based upon available information. After the construction of drilled shafts, the Contractor must expose the top of the ductbank as part of retaining wall construction. At that time, the

			Engineer will determine if ComEd needs to perform a relocation of the ductbank to a lower elevation. Regardless, the Contractor should exercise extreme caution during all construction activities in the vicinity of the ComEd ductbank.
ComEd	Electric	<p>Vaults/Manholes – various locations</p> <p><u>Harrison Street</u>          7806+78.15 - 5.76 RT          7811+24.39 - 16.92 RT</p> <p><u>Halsted Street</u>          3831+24.70 - 15.57 RT          3830+36.13 - 55.21 LT          3830+25.99 - 17.58 RT</p>	ComEd will adjust manholes to final grade. The structure adjustments must be coordinated with ComEd.
AT&T	Telephone / Fiber Optic	Currently located in west portion of Halsted Street	AT&T intends to relocate all lines to duct package under I-290 to the west of Halsted prior to the start of construction. ComEd intends to relocate existing lines from east portion of bridge to the AT&T conduits. After ComEd has relocated lines to new east portion of Halsted Street bridge, the AT&T duct package in the west portion of the existing bridge can be demolished. AT&T has indicated that ducts do not contain asbestos based upon record information. The removal of the existing ducts shall also include any manhole/vault structures within proposed excavations and bridge construction.

<p>AT&amp;T</p>	<p>Telephone / Fiber Optic</p>	<p>Vaults/Manholes – various locations</p> <p><u>Harrison Street</u>        7805+39.64 – 12.99 LT        7807+06.82 – 15.25 RT        7807+11.91 - 15.42 RT</p> <p><u>Halsted Street</u>        3830+47.04 - 13.79 LT        3830+52.91 - 11.65 LT        3831+39.95 – 9.02 LT        3831+45.45 - 15.69 LT        3839+17.00 - 15.00 LT</p> <p><u>Halsted Street</u>        3836+69.45 – 28.19 LT        3834+39.28 – 28.35 LT</p>	<p>AT&amp;T will adjust manholes to final grade. The structure adjustments must be coordinated with ComEd.</p> <p>These structures will be abandoned by AT&amp;T and removed as part of the demolition of the Halsted Street Bridge.</p>
<p>AT&amp;T</p>	<p>Telephone / Fiber Optic</p>	<p>Duct package north of Harrison</p>	<p>AT&amp;T maintains a large package of major copper and fiber optic lines feeds that must not be disturbed during construction without AT&amp;T involvement. Bridge Structure 016-1713 and Retaining wall Structure 016-1802 will be constructed over/around the ductbank. The exact location and depth of the duct has not been determined. Exploration to this date has only included methods that have not included physical location of the concrete encased duct. AT&amp;T may utilize exploratory excavation to identify the exact location of the duct prior to construction. If that location conflicts with proposed current or future improvements, AT&amp;T is expected to lower the portion of the ductbank to avoid any portions of the bridge and retaining wall. If AT&amp;T has not located the ductbank prior to construction, the Contractor must install drilled shaft foundations based upon available information. After the construction of drilled shafts, the Contractor must</p>

			<p>expose the top of the ductbank as part of bridge and retaining wall construction. At that time, the Engineer will determine if AT&amp;T needs to perform a relocation of the ductbank to a lower elevation. Regardless, the Contractor should exercise extreme caution during all construction activities in the vicinity of the AT&amp;T ductbank.</p>
City of Chicago	Communications	Current package in west portion of Halsted Street	<p>A majority of existing copper lines are not active and will be removed prior to bridge reconstruction. Existing fiber optic lines will rerouted during the reconstruction of the west portion of the Halsted Street Bridge. This relocation may not occur until a short time prior to the demolition of the west portion of the bridge. Contractor will install new duct package along west portion of Halsted Street Bridge and roadway reconstruction as shown in the Plans. All work must be coordinated with the City.</p>
City of Chicago	Electric	Roadway lighting along Halsted Street	<p>Roadway lighting will demolished/reconstructed by the Contractor. Existing lighting must be maintained along west portion of Halsted Street during reconstruction of east portion of Halsted Street. This will include aerial cable. After lighting is installed along east portion of Halsted Street, it must be fully operational during the reconstruction of the west portion of Halsted Street.</p>
City of Chicago	Communications	Current package in north portion of Harrison Street	<p>Existing OEMC facilities will be temporarily rerouted outside of the existing bridge. The temporary relocation will utilize poles and aerial cable with connections into existing structures. This relocation is anticipated to be complete prior to the start of construction and remain after the completion of construction due to the future</p>



			contract to reconstruct the Harrison Street bridge over northbound I-90/94. The temporary poles and aerial cable will be located to the south of the existing and proposed bridge, but within the work zone and must be protected.
City of Chicago	Electric	Roadway lighting along Harrison Street	Roadway lighting will demolished/reconstructed by the Contractor.
City of Chicago	Water	Halsted Street	Water main pipe, structures, fire hydrants and other items must be maintained and adjusted or removed as defined in the Plans and specifications. Close coordination with the City of Chicago Department of Water Management must be maintained at all times.
City of Chicago	Water	Harrison Street	Water main pipe, structures, fire hydrants and other items must be maintained and adjusted or removed as defined in the Plans and specifications. Close coordination with the City of Chicago Department of Water Management must be maintained at all times
City of Chicago	Water	54" Feeder Main	Relocation/Removal included in Plans to be executed by Contractor. Close coordination with the City of Chicago Department of Water Management must be maintained at all times
City of Chicago	Water	7' Water Supply Tunnel in Harrison Street and 8' Water Supply Tunnel in Halsted Street	The water tunnels are to be abandoned using concrete bulkheads and grouting of the tunnels under contract 60W36. This work must be complete and accepted prior to the start of any foundation work for the reconstruction of the bridges.

City of Chicago	Traffic	Harrison Street and Halsted Street Intersection Traffic Signals	Removal of existing system and Installation of proposed manholes, controller, cables, conduits, poles and signals will be completed by Contractor.
Chicago Transit Authority	Traction Power Supply Rail	Within median of I-290	CTA has indicated that they may remove or relocate the electrified third rail within the bridge and barrier wall reconstruction limits. Contractor must coordinate with Chicago Transit Authority.
Chicago Transit Authority	Communications	Within median of I-290	CTA has indicated there are signal and other communication cable utilities within the CTA ROW. Locations of existing facilities are to be provided. Contractor is expected to coordinate with Chicago Transit Authority and avoid any and all impacts to all communication systems.

The above represents the best information available to the Department and is included for the convenience of the bidder. The applicable portions of Articles 105.07 and 107.31 of the Standard Specifications shall apply.

In accordance with 605 ILCS 5/9-113 of the Illinois Compiled Statutes, utility companies have 90 days to complete the relocation of their facilities after receipt of written notice from the Department. The 90-day written notice will be sent to the utility companies after the following occurs:

- 1) Proposed right of way is clear for contract award.
- 2) Final plans have been sent to and received by the utility company.
- 3) Utility permit is received by the Department and the Department is ready to issue said permit.
- 4) If a permit has not been submitted, a 15 day letter is sent to the utility company notifying them they have 15 days to provide their permit application. After allowing 15 days for submission of the permit the 90 day notice is sent to the utility company.
- 5) Any time within the 90 day relocation period the utility company may request a waiver for additional time to complete their relocation. The Department has 10 days to review and respond to a waiver request.

## **CTA FLAGGING AND COORDINATION**

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

The CTA's Representative for this project will be:

Mr. David Heard  
Manager, Construction Management Oversight  
(312) 681-3862

### **1.01 SUMMARY**

- A. This section includes the requirements for safe construction operations on, above and adjacent to operating tracks of the CTA rail system. The Contractor shall be responsible for compliance with the CTA Safety Manual for Contract Construction On, Above, or Adjacent to the CTA Rail System in effect at such time.
- B. After the letting of the contract and prior to performing any work, the CTA Representative shall be notified by the Department to attend the preconstruction meeting. In this meeting, the Contractor shall confer with the CTA's Representative regarding the CTA's requirements for the protection of clearances, operations and safety.
- C. Prior to the start of any work on or over the CTA's right-of-way, the Contractor shall meet with the CTA Representative to determine his requirements for flagmen and all other necessary items related to the work activities on, over and next to the CTA facilities and to receive CTA's approval for the Contractor's proposed operations.
- D. The Contractor shall notify the CTA Representative 72-hours in advance of the time he intends to enter upon the CTA right-of-way for the performance of any work.

### **1.02 PROJECT CONDITIONS**

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

- B. The CTA will be operating trains during the construction of this project. The rail operations are 24 hours per day, seven days per week.
- C. Certain portions of the project may be performed on, above or adjacent to sections of track where rail service is suspended in order to facilitate the work. For any work occurring within, above or adjacent to a section of track to be taken out of service, the Contractor shall confirm with the CTA that track within the work limits has been taken out of service and the third rail de-energized, as required, prior to beginning the work.
- D. If the CTA deems any of the Contractor's work or operations hazardous to the CTA's operations or to the public, the CTA shall contact the Engineer. The Engineer may elect to order the Contractor to immediately suspend work until reasonable remedial measures are taken satisfactory to the CTA.
- E. The CTA's may review of any of the Contractor's procedures, methods, temporary structures, tools or equipment that will be utilized within the CTA Right-of-Way. These reviews do not relieve the Contractor of responsibility for the safety, maintenance, and repairs of any temporary structure or work, or for the safety, construction, and maintenance of the work, or from any liability whatsoever on account of any procedure or method employed, or due to any failure or movement of any temporary structure, tools or equipment furnished as necessary to execute work on CTA Right-of-Way.
- F. At least five (5) weeks prior to the start of any work on, above or adjacent to the CTA right-of-way, the Contractor will be required to attend weekly coordination meetings with CTA Operations and other CTA departments to review and coordinate proposed work activities of the Contractor(s). The Contractor will be required to provide a five week look-ahead schedule, in a format acceptable to CTA, reflecting proposed work activities within the CTA Right-of-Way.
- G. The Contractor, through the Engineer, shall submit a Rail Service Bulletin Request form to the CTA at least twenty-one (21) calendar days in advance of the Contractor's proposed scheduled time to enter upon the CTA Right-of-Way for the performance of any work under this Contract. Bulletin requests will be required when performing work which impacts rail operations such as prior to each phase of staged station construction, Track Access Occurrences, track survey, etc.
- H. CTA generally permits only one Track Access Occurrence at a time on any given route. Other work on CTA's system, including required operations and/or maintenance by CTA, or work by other contractors elsewhere on the route, may limit the available dates of track access occurrences for this project. The Contractor is strongly encouraged to submit Rail Service Bulletin requests with more than the twenty-one (21) day minimum required advance notice. The CTA has indicated that they typically will not grant Track Access Occurrences on consecutive weekend periods in order to provide scheduled service to customers.

- I. The Contractor shall at all times observe all rules, safety regulations and other requirements of the CTA, including, but not limited to, the following Standard Operating Procedures (SOP's).
  1. No. 7037, "Flagging on the Right-of-Way".
  2. No. 7038, "Train Operation Through Slow Zones".
  3. No. 7041, "Slow Zones".
  4. No. 8111, "Workers Ahead Warning System".
  5. No. 8130, "Safety on Rapid Transit Tracks".
  6. No. 8212, "Test Train Procedures"
  7. Sketch 2000-SZ-1, Slow Zone Equipment

#### 1.03 REIMBURSEMENT OF COSTS

- A. The cost of all flagmen, infrastructure crews, engineering inspection, switchmen, and other workmen furnished by the CTA and authorized by the Engineer shall be paid for directly to the CTA by the Contractor.
- B. The costs associated with Track Access Occurrences granted and established by the CTA shall be paid for directly to the CTA by the Contractor.
- C. The amount paid to the Contractor shall be the amount charged to the Contractor for all authorized CTA charges including CTA additive rates audited and accepted by the Department, according to Article 107.12 and Article 109.05 of the Standard Specifications.
- D. Following approval of the CTA invoices by the Department, the Contractor shall pay all monies to the CTA as invoiced and shall submit to the Department certified and notarized evidence of the amount of payments. No overhead or profit will be allowed on these payments.
- E. There are maximum amounts of flagger shifts identified within this specification. If Contractor operations require flagger shifts that are granted by the CTA beyond these limits, the Contractor shall pay for the services, but will receive no reimbursement.
- F. The Department will not be liable for any delays by the CTA in providing flagmen, establishing track closures or other service provided by the CTA and identified within this special provision.

#### 1.04 RAIL SAFETY TRAINING

- A. All Contractor and Subcontractor employees assigned to work on, over or near the CTA Right-of-Way shall be required to attend an all-day Rail Right-of-Way Safety Training Session in accordance with the CTA Safety Manual for Contract Construction On, Above, or Adjacent to the CTA Rail System. The cost of this training is currently \$200.00 per employee, paid by the Contractor in advance. The certification is good for one calendar year from the date of issuance. The Contractor shall coordinate rail safety training with the Engineer. The cost of training shall be paid directly to the CTA by the Contractor. Reimbursement of training costs shall be in accordance with the Reimbursement of Costs section of this specification.
- B. Rail Right-of-Way Safety Training for Contractor and subcontractor personnel will be scheduled by CTA as training slots become available. The Contractor is advised that the Contractor's failure to request training sufficiently in advance of when the employee is required on the work site shall not be cause for relaxing the requirement for Rail Right-of-Way Safety Training.
- C. The \$200.00 fee is non-refundable. If any individual fails to report for training or is rejected for training and must be rescheduled, an additional \$200.00 will be required. No additional compensation will be made for the rescheduling of any training.
- D. Upon successful completion of CTA Rail Safety Training, each trainee will be issued a non-transferable Rail Safety Tour Identification Card with the trainee's photo and a decal with pressure sensitive adhesive to be affixed on the hard hat. The Rail Safety Tour Identification Card and the decal are valid for one (1) year from the date of issue. The validity of the Card and the decal are in no way related to the length of this Contract.
- E. Contractor and Subcontractor personnel must renew their Rail Safety Tour Identification Cards annually by successfully completing Rail Safety Training again. Contractor or Subcontractor personnel who fail to maintain a valid Rail Safety Tour Identification Card are not permitted to work on, above or adjacent to the CTA Rail Right of Way and CTA reserves the right to remove such personnel from the work site.
- F. The costs incurred by the Contractor for CTA Rail Safety Training will not be reimbursed.

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

- A. Contractor's and Subcontractor's employees assigned to work on the CTA Right-of-Way:
1. Contractor's and Subcontractor's employees will be given individual property permits. These permits shall be carried by each employee at all times while on CTA property. All permits issued shall be returned to CTA at the completion of the project, if the employee no longer works on this project, or on the date of expiration.
  2. Each employee shall carry a valid Rail Safety Tour Identification Card at all times while on CTA right-of-way in accordance with Article 2-2 of the CTA Safety Manual.
  3. All employees shall wear an undamaged hard hat with current rail safety sticker affixed, CTA standard safety vest and eye protection at all times while on CTA right-of-way. Noise protection shall be used when necessary. The Contractor must also comply with all OSHA requirements as required for the work. The CTA shall provide the rail safety sticker to each Contractor employee upon successful completion of the Rail Right-of-Way Safety Training.
  4. Contractor personnel shall wear suitable work shoes with defined heel and non-slip soles. Steel toes or metal cleats on the sole or heel of shoes are prohibited. Shoelaces are to be kept short so they do not pose a tripping hazard. Athletic shoes, sandals, open-toed shoes, moccasins and/or shoes with heels higher than 1" are not permitted.
  5. Contractor personnel shall have a non-metallic, working flashlight after dark or when working in the subway.
- B. Contractor and Subcontractor employees assigned to work adjacent to or above the CTA right-of-way shall wear a CTA standard safety vest at all times. Personnel without current Rail Safety Training and a valid property permit shall not enter onto any CTA Right-of-Way.

## 1.06 WORK AREA AVAILABILITY

### A. DEFINITIONS

1. RIGHT-OF-WAY WORK: Any work performed at, above, or below track level within the CTA Right-of-Way.
2. IN-SERVICE TRACK: All CTA tracks are in service seven days a week, 24 hours a day, unless specifically removed from service for specific times by a Rail Service Bulletin issued by the Vice President, Rail Operations. Copies of the CTA's current train schedule for the lines affected by this project is available on the CTA's website and are subject to changes at any time, before or during, the Contract.
3. OUT-OF-SERVICE TRACK: The CTA tracks within limits defined by CTA that are temporarily removed from service for the purpose of completing specific work. Traction power will remain on at all times unless power removal is requested by the Contractor and approved by the CTA. In such cases, traction power must be removed and restored by CTA personnel. The Contractor may request the CTA to de-energize portions of the CTA right-of-way to perform work on, or near an Out-of-Service Track when no revenue service is scheduled, or as specified under a Rail Service Bulletin. Upon completion of the Out-of-Service Work, the Contractor shall maintain sufficient personnel on-site to correct any deficiencies in the Contractor's Work discovered by the CTA during power and service restoration and testing.
4. TRACK ACCESS OCCURRENCE: A condition(s) which provides a modification to the normal operation of CTA service to facilitate access for a Contractor(s) to perform work on or near the CTA Right-of-Way as defined and limited herein.
5. RE-ROUTE: Modification to the normal routing of trains in order to remove rail traffic from a section of track to facilitate access for a Contractor(s) to perform work on or near the CTA Right-of-Way as defined and limited herein.
6. LINE CUT: A temporary cessation of all service on a transit line; meaning total stoppage of transit service on all tracks and at all stations within the closure zone to facilitate access for a contractor(s) to perform work on or near the CTA Right-of-Way as defined and limited herein.
7. SINGLE-TRACK: A temporary operation established by operating trains bi-directionally on one track while the adjacent track is taken out-of-service as defined in paragraph 1.05.a.4, above. Only one single-track at a time can be set up on a line and only for very limited time periods. If CTA or a separate contractor(s) request single track operations along the same line concurrently with the Contractor for this contract, CTA shall have the exclusive authority to determine which request shall be granted.



8. RUSH HOURS: Monday through Friday, from 0500 to 0900 hours and from 1500 to 1900 hours.
  9. FLAGGER SHIFT: A flagger shift is defined as the services of a CTA Flagman up to, but no more than eight (8) hours including travel and required breaks. For example:
    - a. A Contractor five hour work shift which requires 3 flaggers will use 3 flagger shifts.
    - b. A Contractor eight hour work shift requiring 3 flaggers shall use 6 flagger shifts (because travel & break time will increase the flaggers work hours beyond eight).
    - c. A Contractor ten hour work shift requiring 3 flaggers will use 6 flagger shifts.
  10. INFRASTRUCTURE SHIFT: An infrastructure shift is defined as up to, but no more than eight (8) hours worked per CTA Infrastructure employee. For example:
    - a. A Contractor five hour work shift requiring 2 signal maintainers will use 2 infrastructure shifts.
    - b. A Contractor eight hour work shift requiring 2 towermen shall use 2 infrastructure shifts.
    - c. A ten hour work shift requiring 2 lineman will use 4 infrastructure shifts.
  11. PERSON-IN-CHARGE (PIC): A person or persons, specified in a CTA Rail Service Bulletin, who is solely in charge of a work zone and is the single point contact between CTA and all persons (Contractor's, CTA and others) working in a work zone. The Rail Service Bulletin may identify the PIC by name or by radio call number. The Engineer or the Engineer's designee shall serve as PIC.
  12. POWER & WAY SERVICE BULLETIN (PWS Bulletin): A document authorized by the CTA Infrastructure Division intended to supplement a CTA Rail Service Bulletin by defining power/signal removal and restoration procedures and other work zone protection measures required to safely perform construction and/or maintenance work on or adjacent to the CTA Right-of-Way (ROW).
- B. No service disruptions will be allowed for the completion of this work, except as noted herein. If the CTA deems it necessary, the CTA will impact operations to avoid a hazardous condition to either the passengers or employees and charge the Contractor for all associated costs and damages incurred. No compensation will be made for CTA charges to the Contractor due to unauthorized Contractor access or other unapproved impacts to CTA operations.

## 1.07 CTA OPERATING REQUIREMENTS

1. Strictly comply with operating requirements of the Chicago Transit Authority while construction work is in progress, specifically as follows:
  1. All work performed on the CTA Right-of-Way will be allowed during the Construction Period only in accordance with the Article 1.07 "ALLOWABLE HOURS OF CONSTRUCTION". During most periods of construction, a "slow zone" shall be established at the work site and flagging personnel shall be deployed to facilitate safe and continuous train operations and to protect Contractor, CTA employees, passengers, the general public and property in the vicinity.
  2. No one is permitted to enter the CTA Right-of-Way during Rush Hours. Access to the underside of the existing or proposed bridge structure within the limits of the CTA Right-of-Way will not be permitted.
2. As much work as possible is to be done under normal CTA operating conditions (under traffic) without disruption of train movements. A maximum interruption of service to the CTA traffic of 15 minutes or as agreed upon with the CTA will be allowed. No interruption to CTA service will be allowed unless approved in writing by the CTA. The CTA has indicated during overnight periods, train headways are between fifteen (15) and thirty (30) minutes.
3. Pedestrian traffic to the CTA facility entrance at Halsted Street shall be maintained at all times. Barricades and signage for sidewalk closures as well as all details for pedestrian crossings of Halsted Street at the entrance of the station must be coordinated with the CTA at least twenty-eight (28) days prior to modifications to staging.
4. Access control of the CTA Right-of-Way must be maintained at all times. This includes eliminating openings directly to the Right-of-Way where existing median barriers are to be removed. All planned removals of existing access control must be coordinated with the CTA, with plans for counter measures provided to the CTA at least three (3) weeks prior to removals.

## 1.08 ALLOWABLE HOURS OF CONSTRUCTION

- A. Construction activities within CTA Right-of-Way are not permitted during Rush Hours. Access to the underside of the existing or proposed bridge structure within the limits of the CTA Right-of-Way will not be permitted during Rush Hours.
- B. Construction activities within CTA Right-of-Way may be permitted during non-Rush Hour periods under flagging protection with the advance concurrence of the CTA as follows:

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

C. Track Access Occurrences:

1. The total number of Track Access Occurrences shall be as specified below:
  - a. Overnight Single Tracks: A maximum of thirty (30) Overnight Single-Track Track Access Occurrences will be permitted. Construction activities within the CTA Right-of-Way may be permitted between the hours of 22:00 and 04:00 the following morning, including any time required for test trains stipulated in the Rail Service Bulletin.
  - b. Weekend Single Tracks: A maximum of eight (8) Weekend Single-Track Track Access Occurrences will be permitted. Construction activities within the CTA Right-of-Way may be permitted between the hours of 22:00 Friday night and 04:00 the following Monday morning, including any time required for test trains stipulated in the Rail Service Bulletin.
2. The exact dates and hours for all Track Access Occurrences are subject to change by the CTA depending on the nature of the work, access requirements of CTA personnel, work performed under separate contract or operational requirements of the CTA. The approval of specific dates and times for Track Access Occurrences on this Contract may be affected by major events or by a Track Access Occurrence scheduled elsewhere on that route or the CTA System. The CTA has indicated that they typically will not grant Track Access Occurrences on consecutive weekend periods in order to provide scheduled service to customers.
3. The Department has identified the following windows to the CTA for completing proposed work adjacent to the eastbound track. The majority of requested Track Access Occurrences should be for weekend and weeknight periods during the following windows:
  - a. Stage 1 – February 1, 2014 through July 31, 2014
  - b. Stage 2 – September 1, 2014 through March 31, 2015

The CTA may grant access outside of the above window(s) depending on Contractor progress and Contractor needs.

4. Contractors completing other Department projects may also request Track Access Occurrences along the same section of track as described herein. These projects are identified in CONTRACTOR COOPERATION. Provided these Track Access Occurrences are approved, scheduled and initiated by the CTA, the Contractor shall be able to access CTA Right-of-Way with no impact to the total count of Track Access Occurrences attributed to this Contract.
  
- D. The CTA reserves the right to modify the allowable dates or hours of track access occurrences based on service requirements for the subject route and manpower availability for the date and location requested.
  
- E. The CTA reserves the right to deny or to cancel a previously approved request for a Track Access Occurrence based on service requirements for the time period requested. The CTA may notify the Contractor of such denial or cancellation no later than 1 day prior to a Track Access Occurrence. Service requirements may be affected by major events (e.g., festivals, White Sox and Cubs games, concerts), or by a Track Access Occurrence scheduled elsewhere on that route or the CTA System.
  
- F. The Contractor will not be permitted to perform work requiring a Track Access Occurrence or Flagging during the following special events:
  1. Taste of Chicago
  2. Independence Day
  3. Chicago Air and Water Show
  4. Chicago Marathon
  5. Chicago Jazz Festival
  6. Chicago Blues Festival
  7. Chicago St. Patrick's Day Parade
  8. The Saturday before Thanksgiving Day through the Monday following Thanksgiving
  9. New Year's Eve and New Year's Day
  10. Easter Sunday
  11. Gospel Fest
  12. Chicago White Sox Home Games
  13. Chicago Cubs Home Games
  14. Chicago Bears Home Games
  15. Lollapalooza
  16. Pride Parade

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

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

## 1.09 CONSTRUCTION PROCESS PLAN

- A. CTA will require the Contractor to submit a Construction Process Plan whenever any work, in the opinion of the CTA, affects the safety or causes disruption of service or inconvenience to transit users, CTA Operations or impacts CTA Right-of-Way,. At a minimum, an individual Construction Process Plan shall be required for each instance the Contractor requests a Track Access Occurrence from CTA and for any work that requires flagging protection from CTA.
- B. A draft Construction Process Plan must be submitted to CTA by such method as the CTA may direct, at least twenty-one (21) calendar days in advance of work and at least fourteen (14) calendar days prior to a pre-activity meeting. The plan shall include/address the following:
1. Applicable Contract Documents
  2. Options
  3. Possible conflicts
  4. Compatibility problems
  5. Time schedules
  6. Weather limitations
  7. Temporary facilities & signage
  8. Space and access limitations
  9. Governing regulations
  10. Safe Work Plans (including Hazard Analysis)
  11. CTA Operations Impact
  12. Proposed Traffic Control & Staging Areas
  13. Lift Plan
- C. The draft plan must also include reference to all Contractor Requests for Information (RFI's) and submittals that pertain to work identified in the plan.
- D. In addition, for any work to be performed during a Track Access Occurrence, the Contractor shall provide the following to the CTA:
1. A track access plan submitted to and approved by the CTA specifically identifying the area(s) of power removal and work zone protection methods being requested by the Contractor.
  2. Work zone protection methods to be performed by the Contractor
  3. Name, title, contact information, and work hours for Contractor's on-site supervision
  4. Work zone protection requested by the Contractor for implementation by the CTA (subject to CTA approval).
  5. Pre-approved Safety and Quality Control Checklists, applicable to the work elements being performed during the specific track(s) outage request for completion by the Contractor and submission to the Person-In-Charge during Track Access Occurrence.
  6. A general schedule reflecting proposed work to be performed within the requested Track Access Occurrence.

- E. After pre-activity meeting minutes have been agreed to, all comments from the meeting must be incorporated into a final Construction Process Plan. This plan must be submitted and approved by the Engineer and CTA prior to the start of related work.
- F. Prior to the CTA implementing an authorized Track Access Occurrence, the Contractor must provide, at least 48 hours in advance, an hourly schedule broken into tasks with a defined critical path that clearly establishes milestones that may be monitored. The hourly schedule shall also include, but not be limited to:
1. Name, title, contact information, and work hours for Contractor's on-site supervision.
  2. Power removal (min 1 hour)
  3. Proposed work activities.
  4. Activities for inspection and completion of safety & quality checklists by Contractor.
  5. Submission of safety & quality checklists to the CTA's Person-In-Charge (PIC) during Track Access Occurrence. The checklists shall be submitted to the PIC prior to commencing power restoration activities.
  6. Power, Signal Restoration (min 1 hour).
  7. Test train (min ½ hour).
- G. The CTA intends to issue Power & Way Service Bulletins to supplement CTA Rail Service Bulletins. The Power & Way Service Bulletins are intended to provide procedural guidelines for safely removing and restoring the CTA's power & way systems (primarily traction power & signal) within the limits defined by the contract and Contractor's specific track outage plan(s).
- H. CTA labor shall be required to de-energize and re-energize traction power and perform such other work as may be deemed by the CTA to be required pursuant to the Contractor's work activities and authorized Track Access Occurrences, etc. CTA Signal Maintainer shall also be required to observe and witness the Contractor disconnection and reconnection of temporary signal work at each location where modifications are performed to support construction activities. One Signal Maintainer will be required to witness testing at each location or housing where it is taking place. CTA Signal Maintainer shall also be required to witness the Contractor restoration safety testing, prior to the line being returned to the CTA.

- I. Two Linemen will be required at each location where traction power is energized or de-energized. The Contractor's schedule must include travel time for the CTA Electrician's (min ½ hour) if they are to energize or de-energize traction power at more than one location.
- J. Failure of the Contractor to provide the CTA the minimum specified time required for the removal and restoration of all Power & Way systems within an authorized Track Access Occurrence will result in specified liquidated damages for failure to return track(s) to service in accordance with the contract requirements. There will be no reimbursement for liquidated damages charged to the Contractor by CTA. The following schedule for liquidated damages had been established by the CTA.

From 1 minute through 29 minutes delay - \$5,000.00

From 30 minutes through 59 minutes delay – an additional \$5,000.00

For each additional hour or fraction thereof - \$30,000.00 per hour

#### 1.10 HAZARDOUS WORKING CONDITIONS

- A. The Contractor shall caution all employees of the presence of electric third rail (600 volts DC), live cables and moving trains on CTA tracks. The Contractor shall take all necessary precautions to prevent damage to life or property through contact with the electrical or operations systems. The Contractor shall caution all employees that any contact with live electric third rail or "live" portions of train undercarriage may result in a severe burn or death.
- B. The Contractor shall establish third-rail safety precautions in accordance with CTA regulations, such as using insulating hoods or covers for live third rail or cables adjacent to the work. On every day and at every work site where a live third rail hazard exists, the Contractor shall instruct all employees of the emergency procedures. Knowledge of the disconnect switch locations or manner of disconnection shall be available at all times to the personnel on the job. Unless otherwise noted, only CTA Electricians are allowed to disconnect power.
- C. The third rail may be de-energized during authorized Track Access Occurrences. The planning and implementation of the de-energizing shall be listed in the Contractor's process plan and include documenting checklist requirements.

#### 1.11 TRACK SAFETY

- A. The Contractor shall, at all times, take special care to conduct operations over, on, under, adjacent to, or adjoining, the CTA Right-of-Way in such a manner as not to cause damage, settlement or displacement of any structures, tracks or any portion thereof. The Contractor shall suspend such work until reasonable remedial measures, satisfactory to the Engineer and CTA, have been taken.

- B. Any damages to the CTA tracks, supporting structures or other existing facilities and properties caused by the Contractor's operations shall be replaced or repaired by the Contractor to the satisfaction of the CTA without reimbursement. Contractor shall obtain photo documentation of damaged property to the CTA prior to performing any repair or replacement work.
- C. The CTA shall have the right to perform any work it deems to be of an emergency nature and/or necessary to permit normal train operations during construction operations by the Contractor. The work to be completed by the CTA may impact the ongoing Contractor operations. If the emergency work is required due to Contractor actions, the cost of such service or emergency work provided by the CTA shall be borne by the Contractor with no reimbursement by the Department.
- D. All work shall comply with the CTA Safety Manual for Contract Construction On, Above, or Adjacent to the CTA Rail System and CTA Standard Operating Procedures.
- E. The Contractor shall take such precautions as are necessary to ensure the safety and continuity of the CTA operations and passengers. The Contractor shall provide a minimum horizontal clearance of 7'-2" from the centerline of the nearest tangent track to any falsework, bracing and forms or other temporary obstruction during the work under this Contract. The clearance requirements for curved track sections must be calculated by the Contractor to ensure encroachment into the clearance envelope will not occur. Prepare, submit and obtain approval of detailed drawings prepared and sealed by a licensed structural engineer in the state of Illinois for all falsework, sheeting and construction procedures adjacent to and under the tracks before doing any work on same. After obtaining approval of such plans, said falsework, sheeting and construction procedures shall be constructed strictly in accordance with the approved drawings and specifications. All submittals must be submitted to the Engineer to be provided to the CTA. In case of any settlement or displacement of structures or tracks, the Contractor shall immediately proceed with all shoring or other work necessary to maintain the CTA property in a safe condition for the operation of train service. If the Contractor fails to undertake this work within 24 hours after notice by the Engineer in writing, the CTA may proceed to repair or shore any such structure or tracks; and the cost thereof shall be billed to the Contractor with no compensation. If the settlement or displacement is severe enough to limit train service, the repairs shall be made immediately. All costs of any disruption to the CTA service due to the Contractor's operations or negligence shall be at the Contractor's expense with no compensation.
- F. In limited cases and with advance authorization by the CTA, a minimum horizontal clearance of 6'-1" between the centerline of the nearest tangent track and an obstruction may be allowed. This clearance does not allow CTA or Contractor personnel to safely stand between the obstruction and an operating train. In addition, an obstruction at this clearance is a hazard to motormen with a cab window open. Any required flagging by the CTA will need to be requested as described herein.



- G. A minimum vertical clearance of 14'-6" (4.42 m) above the high running rail the CTA tracks must be provided at all times.
- H. Protective Shield
  - 1. The Contractor shall furnish, install, and later remove a protective shield to protect the CTA traffic from damage due to falling material and objects during construction.
  - 2. Protective shield will be necessary for any demolition activities during the removal of the existing structure as well as superstructure construction of the proposed structure.
  - 3. The protective shield may be a platform, a net, or any other Department approved structure.
  - 4. Any protective shield required, as indicated on the plans and the supporting members shall be designed to sustain a load of 200 pounds per square foot in addition to its own weight.
  - 5. Drawings and design calculations for the protective shield shall be stamped by an Illinois Licensed Structural Engineer and shall be submitted to the Department for approval. The protective shield shall be constructed only after the Department has approved the drawings and the design.

#### 1.12 TRACK FLAGGING OPERATIONS

- A. Temporary Track Flagging slow zones per CTA SOP 7041 and "CTA Safety Manual for Contract Construction on or Near the CTA Rail System" are restricted in the following manner:
  - 1. Temporary track flagging slow zones can only be mobilized, utilized and demobilized in non-rush hour time periods and no more than one (1) Track Flagging Operation zone will be permitted at any given time. The CTA will be the responsible party responsible to furnish and install the required slow zone signage and equipment. A Track Flagging Operation zone is defined as a contiguous work zone, of no more than 600 feet in length, regardless of the number of tracks fouled. The costs for all manpower, signage and equipment for flagging operations will be billed by the CTA to the Contractor with reimbursement as defined herein.
  - 2. Current Standard Operating Procedures require Slow Zone with flagging protection whenever three or more workers are scheduled to work on, across or near a section of track for one half hour or more. Flagging protection shall be ordered and assigned according to the CTA Flagmen Requirements Manual. These standards must be adhered to and the number of flagmen assigned to a work location shall be as required by the CTA Flagmen Requirements Manual that is available for public viewing at CTA Headquarters upon request.

3. Temporary Track Flagging slow zone signs will be placed, removed or turned by the CTA so the sign cannot be read from the motor cab or hooded to cover the sign so it may not be read from the motor cab when the work crew clears the Right-of-Way.
  4. The Contractor shall provide the Engineer with a written request for flagmen and other personnel at least seventy two (72) hours (two normal working days and before noon) prior to the date, and time the work will be performed and the CTA personnel are requested. The Engineer or the Engineer's designee will coordinate all flagmen requests with the CTA.
  5. A maximum of Sixty (60) flagger shifts will be reimbursed as part of the Contract. The costs for additional flagger shifts required for the Contractor's operations that are requested and granted by the CTA will not be reimbursed.
- B. The providing of such personnel and any other safety precautions taken by the CTA shall not relieve the Contractor of any liability for death, injury or damage arising in connection with the construction operations. See CTA SOP No. 7037, "Flagging on the right-of-way", for a description of flagging personnel duties.
- C. To minimize flagmen usage, the Contractor shall use approved barricades, barricaded scaffolds and/or safety railings. Barricades and safety railing arrangements shall be in accordance with Section 4-5.3 of the CTA Safety Manual for Contract Construction On, Above, or Adjacent to the CTA Rail System.
- D. The CTA does not guarantee that flagging or other personnel will always be available when requested. The Contractor shall be advised that requests for flagging manpower must conform to the CTA Flagman Requirements Manual, and certain work locations require multiple flagging personnel when only one track is fouled by the work.
- E. The Contractor shall pay for all flagging and other personnel costs incurred and charged by the CTA. The cost for the each flagger shift shall be \$900.00 per flagger shift. The Contractor shall also be responsible to reimburse the CTA for all costs associated with the use of other personnel for infrastructure shifts throughout the duration of the contract. The cost for any other CTA personnel (signalmen, linemen, towermen, etc.) shall be \$1,100.00 per infrastructure shift.
- F. By labor contract, CTA flagging personnel are entitled to a 30-minute break after a continuous 5-1/2 hour work period, including report and travel time. The 5-1/2 hour period begins when the person reports to work at his or her home terminal. Additionally, flagging personnel are entitled to occasional personal breaks (to use the washroom facilities) during the normal course of work. When flagging personnel leave the work site, work must cease unless provision is made for a relief flagger. The Contractor shall coordinate the Project work schedule with the flagging personnel break periods.

- G. All employees of the Contractor and subcontractors shall report any actions of perceived CTA employee misconduct, or if any CTA employee does not provide a full level of cooperation in support of the contract; immediately and directly to the Engineer. The Engineer will provide written correspondence to the CTA Project Manager, as well as CTA Operations. Only with timely, written documentation will CTA be enabled to resolve work site personnel issues and take appropriate disciplinary action, when necessary.
- H. If the Contractor, Engineer, CTA Construction or Safety Inspector believes that the Flagman is unable to perform his/her duties responsibly, work shall be stopped immediately, ensure that the Right-of-Way is safe for train operations, and the Work Crew shall exit, without delay, the Rail System Right-of-Way. The Contractor must contribute incident information to the Engineer to that a written report can be submitted to the CTA prior to the end of the workday.
  - 1. In addition, all employees of the Contractor and subcontractors must report any actions of perceived CTA employee misconduct, or if any CTA employee does not provide a full level of cooperation in support of the contract immediately to the Engineer. The Engineer will then contact the CTA's Control Center and/or CTA Rail Operations Route Manager. Within 24 hours of alleged incident, the Engineer must provide a written report to the CTA including detailed explanation of incident, employee badge numbers, location of incident, etc. The Contractor must contribute incident information to the Engineer.
  - 2. Failure to make the proper notification in writing may adversely affect any claim that the Department may file with respect to CTA employee performance or lack thereof.
- I. CTA Flaggers only provide flagging protection for the CTA Right-of-Way, and only CTA Flaggers are permitted to provide flagging protection for the CTA Right-of-Way. Flaggers for streets, highways or other railroads are solely the responsibility of the Contractor, and will not be permitted to provide flagging protection for the CTA Right-of-Way. Any additional flagging required by other agencies or railroads is the responsibility of the Contractor.

#### 1.13 TRACK ACCESS OCCURRENCES

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

- B. The Contractor shall allow enough time prior to putting the tracks back into service to make sure the line can be fully operational. A test train shall be required after any construction activity, determined by the Engineer or CTA, to require a test train. The scheduling of test trains must include travel time to and from the location being tested. Additional time should also be allowed for any possible remedial work required before the system can be made fully operational.
- C. All components of the system, including, but not limited to, tracks, signals, stations, entrances, etc. must be fully and properly operational prior to putting the tracks and facilities back into service. Any facilities under demolition or construction and any temporary facilities must be safe and secure so they do not impact revenue service operations.
- D. The Contractor shall be subject to fines if any station, facility, yard, structure, track, or component is not fully operational and useable at the prescribed predetermined time; including all planned staging of construction sites. The CTA will identify appropriate fines at the time of the incident. No compensation will be made for fines levied by the CTA due to Contractor actions or delays in providing CTA facilities at prescribed times.
- E. The Contractor shall clean all debris and equipment from the work or staging areas after work has been completed after each work day. In the event the Contractor fails to so clean to the CTA's satisfaction, the CTA may perform any necessary cleaning and fine the Contractor the cost of such cleaning. No compensation will be made for fines levied by the CTA due to delays and cleaning costs.

**AGGREGATE FOR CONCRETE BARRIER (D-1)**

Effective: March 11, 2004

Revised: January 24, 2008

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

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

## **AGGREGATE SUBGRADE IMPROVEMENT (D-1)**

Effective: February 22, 2012

Revised: January 1, 2013

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	1004.06	
(b)	Reclaimed Asphalt Pavement (RAP) (Notes 1, 2)	1031	

Note 1. Crushed RAP, from either full depth or single lift removal, may be mechanically blended with aggregate gradations CS 01 or CS 02 but shall not exceed 40 percent 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 gradations CS 01 or CS 02 are used in lower lifts. When RAP is blended with any of the coarse aggregates, the blending shall be done with mechanically calibrated feeders.

**303.03 Equipment.** The vibratory machine shall be according to Article 1101.01, or as approved by the Engineer.

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

**303.05 Placing Aggregate.** The maximum nominal lift thickness of aggregate gradations CS 01 or CS 02 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:

“ **1004.06 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.
- (b) Quality. The coarse aggregate shall consist of sound durable particles reasonably free of deleterious materials.
- (c) Gradation.
  - (1) The coarse aggregate gradation for total subgrade thickness less than or equal to 12 in. (300 mm) shall be CS 01.

The coarse aggregate gradation for total subgrade thickness more than 12 in. (300 mm) shall be CS 01 or CS 02.

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
CS 02		100	80 ± 10	25 ± 15	

Grad No.	COARSE AGGREGATE SUBGRADE GRADATIONS (Metric)				
	Sieve Size and Percent Passing				
	200 mm	150 mm	100 mm	50 mm	4.75 mm
CS 01	100	97 ± 3	90 ± 10	45 ± 25	20 ± 20
CS 02		100	80 ± 10	25 ± 15	

- (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 01, 2011

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

Reclaimed Asphalt Pavement (RAP) may be blended with gravel, crushed gravel, crushed stone crushed concrete, crushed slag, chats, crushed sand stone or wet bottom boiler slag. The RAP materials shall be crushed and screened. Unprocessed RAP grindings will not be permitted. The RAP shall be uniformly graded and shall pass the 1.0 in. (25 mm) screen. When RAP is blended with any of the coarse aggregate listed above, the blending shall be done mechanically with calibrated feeders. The feeders shall have an accuracy of  $\pm 2.0$  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.

**DRAINAGE AND INLET PROTECTION UNDER TRAFFIC (DISTRICT 1)**

Effective: April 1, 2011

Revised: April 2, 2011

Add the following to Article 603.02 of the Standard Specifications:

- “ (i) Temporary Hot-Mix Asphalt (HMA) Ramp (Note)..... 1030
- (j) Temporary Rubber Ramps (Note 2)

Note 1. The HMA shall have maximum aggregate size of 3/8 in. (95 mm).

Note 2. The rubber material shall be according to the following.

Property	Test Method	Requirement
Durometer Hardness, Shore A	ASTM D 2240	75 $\pm$ 15
Tensile Strength, psi (kPa)	ASTM D 412	300 (2000) min
Elongation, percent	ASTM D 412	90 min
Specific Gravity	ASTM D 792	1.0 - 1.3
Brittleness, °F (°C)	ASTM D 746	-40 (-40)°

Revise Article 603.07 of the Standard Specifications to read:

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

When castings are under traffic before the final surfacing operation has been started, properly sized temporary ramps shall be placed around the drainage and/or utility castings according to the following methods.

- (a) Temporary Asphalt Ramps. Temporary hot-mix asphalt ramps shall be placed around the casting, flush with its surface and decreasing to a featheredge in a distance of 2 ft (600 mm) around the entire surface of the casting.
- (b) Temporary Rubber Ramps. Temporary rubber ramps shall only be used on roadways with permanent posted speeds of 40 mph or less and when the height of the casting to be protected meets the proper sizing requirements for the rubber ramps as shown below.

Dimension	Requirement
Inside Opening	Outside dimensions of casting + 1 in. (25 mm)
Thickness at inside edge	Height of casting $\pm$ 1/4 in. (6 mm)
Thickness at outside edge	1/4 in. (6 mm) max.
Width, measured from inside opening to outside edge	8 1/2 in. (215 mm) min

Placement shall be according to the manufacturer's specifications.

Temporary ramps for castings shall remain in place until surfacing operations are undertaken within the immediate area of the structure. Prior to placing the surface course, the temporary ramp shall be removed. Excess material shall be disposed of according to Article 202.03."

**EMBANKMENT 1**

Effective: March 01, 2011

Description. This work shall be according to Section 205 of the Standard Specifications except for the following.

Material. All material shall be approved by the District Geotechnical Engineer. The proposed material must meet the following requirements.

- a) The laboratory Standard Dry Density shall be a minimum of 90 lb/cu ft (1450 kg/cu m) when determined according to AASHTO T 99 (Method C).
- b) The organic content shall be less than ten percent determined according to AASHTO T 194 (Wet Combustion).
- c) Soils which demonstrate the following properties shall be restricted to the interior of the embankment and shall be covered on both the sides and top of the embankment by a minimum of 3 ft (900 mm) of soil not considered detrimental in terms of erosion potential or excess volume change.



- 1) A grain size distribution with less than 35 percent passing the number 75 um (#200) sieve.
  - 2) A plasticity index (PI) of less than 12.
  - 3) A liquid limit (LL) in excess of 50.
- d) Reclaimed asphalt shall not be used within the ground water table or as a fill if ground water is present.

### CONSTRUCTION REQUIREMENTS

Samples. Embankment material shall be sampled, tested, and approved before use. The contractor shall identify embankment sources, and provide equipment as the Engineer requires, for the collection of samples from those sources. Samples will be furnished to the Geotechnical Engineer a minimum of three weeks prior to use in order that laboratory tests for approval and compaction can be performed. Embankment material placement cannot begin until tests are completed and approval given.

Placing Material. In addition to Article 202.03, broken concrete, reclaimed asphalt with no expansive aggregate, or uncontaminated dirt and sand generated from construction or demolition activities shall be placed in 6 inches (150 mm) lifts and disked with the underlying lift until a uniform homogenous material is formed. This process also applies to the overlying lifts. The disk must have a minimum blade diameter of 24 inches (600 mm).

When embankments are to be constructed on hillsides or existing slopes that are steeper than 3H:1V, steps shall be keyed into the existing slope by stepping and benching as shown in the plans or as directed by the engineer.

Compaction. Soils classification for moisture content control will be determined by the Soils Inspector using visual field examination techniques and the IDH Textural Classification Chart.

When tested for density in place each lift shall have a maximum moisture content as follows.

- a) A maximum of 110 percent of the optimum moisture for all forms of clay soils.
- b) A maximum of 105 percent of the optimum moisture for all forms of clay loam soils.

Stability. The requirement for embankment stability in Article 205.04 will be measured with a Dynamic Cone Penetrometer (DCP) according to the test method in the IDOT Geotechnical Manual. The penetration rate must be equal or less than 1.5 inches (38 mm) per blow.

Basis of Payment. This work will not be paid separately but will be considered as included in the various items of excavation.

**BITUMINOUS PRIME COAT FOR HOT-MIX ASPHALT PAVEMENT (FULL DEPTH) (D-1)**

Effective: May 01, 2007

Revise Article 407.06(b) of the Standard Specifications to read:

“A bituminous prime coat shall be applied between each lift of HMA according to Article 406.05(b) at a rate of 0.02 to 0.05 gal/sq yd (0.1 to 0.2 L/sq m), the exact rate to be determined by the Engineer.”

Revise the second paragraph of Article 407.12 of the Standard Specifications to read:

“Prime Coat will be paid for at the contract unit price per gallon (liter) or per ton (metric ton) for BITUMINOUS MATERIALS (PRIME COAT).”

**FINE AGGREGATE FOR HOT-MIX ASPHALT (HMA) (D-1)**

Effective: May 01, 2007

Revised: January 1, 2012

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

“(c) Gradation. The fine aggregate gradation for all HMA shall be FA1, FA 2, FA 20, FA 21 or FA 22. When Reclaimed Asphalt Pavement (RAP) is incorporated in the HMA design, the use of FA 21 Gradation will not be permitted.

**FRICITION SURFACE AGGREGATE (D-1)**

Effective: January 01, 2011

Revised: February 26, 2013

Revise Article 1004.01(a)(4) of the Standard Specifications to read:

“(4) Crushed Stone. Crushed stone shall be the angular fragments resulting from crushing undisturbed, consolidated deposits of rock by mechanical means. Crushed stone shall be divided into the following, when specified.

- a. Carbonate Crushed Stone. Carbonate crushed stone shall be either dolomite or limestone. Dolomite shall contain 11.0 percent or more magnesium oxide (MgO). Limestone shall contain less than 11.0 percent magnesium oxide (MgO).
- b. Crystalline Crushed Stone. Crystalline crushed stone shall be either metamorphic or igneous stone, including but is not limited to, quartzite, granite, rhyolite and diabase.”

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

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

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

Use	Mixture	Aggregates Allowed
Class A	Seal or Cover	<u>Allowed Alone or in Combination:</u> Gravel Crushed Gravel Carbonate Crushed Stone Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag Crushed Concrete
HMA All Other	Shoulders	<u>Allowed Alone or in Combination:</u> Gravel Crushed Gravel Carbonate Crushed Stone Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) <sup>1/</sup> Crushed Steel Slag <sup>1/</sup> Crushed Concrete
HMA High ESAL Low ESAL	C Surface IL-12.5,IL-9.5, or IL-9.5L	<u>Allowed Alone or in Combination:</u> Crushed Gravel Carbonate Crushed Stone Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) <sup>1/</sup> Crushed Steel Slag <sup>1/</sup> Crushed Concrete

Use	Mixture	Aggregates Allowed	
HMA High ESAL	D Surface IL-12.5 or IL-9.5	<u>Allowed Alone or in Combination:</u> Crushed Gravel Carbonate Crushed Stone (other than Limestone) Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) <sup>1/</sup> Crushed Steel Slag <sup>1/</sup> Crushed Concrete	
		<u>Other Combinations Allowed:</u>	
		<i>Up to...</i>	<i>With...</i>
		25% Limestone	Dolomite
		50% Limestone	Any Mixture D aggregate other than Dolomite
75% Limestone	Crushed Slag (ACBF) <sup>1/</sup> or Crushed Sandstone		
HMA High ESAL	F Surface IL-12.5 or IL-9.5	<u>Allowed Alone or in Combination:</u> Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) <sup>1/</sup> Crushed Steel Slag <sup>1/</sup>  No Limestone or no Crushed Gravel alone.	
		<u>Other Combinations Allowed:</u>	
		<i>Up to...</i>	<i>With...</i>
		50% Crushed Gravel, or Dolomite	Crushed Sandstone, Crushed Slag (ACBF) <sup>1/</sup> , Crushed Steel Slag <sup>1/</sup> , or Crystalline Crushed Stone

Use	Mixture	Aggregates Allowed
HMA High ESAL	SMA Ndesign 80 Surface	Crystalline Crushed Stone Crushed Sandstone Crushed Steel Slag

1/ When either slag is used, the blend percentages listed shall be by volume.

Add to Article 1004.03 (b) of the Standard Specifications to read:

“ When using Crushed Concrete, the quality shall be determined as follows. The Contractor shall obtain a representative sample from the stockpile, witnessed by the Engineer, at a frequency of 2500 tons (2300 metric tons). The sample shall be a minimum of 50 lb (25 kg). The Contractor shall submit the sample to the District Office. The District will forward the sample to the BMPR Aggregate Lab for MicroDeval Testing, according to Illinois Modified AASHTO T 327. A maximum loss of 15.0 percent by weight will be applied for acceptance. The stockpile shall be sealed until test results are complete and found to meet the specifications above.”

**GROUND TIRE RUBBER (GTR) MODIFIED ASPHALT BINDER (D-1)**

Effective: June 29, 2006

Revised: January 01, 2013

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

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

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

Note 1. GTR shall be produced from processing automobile and/or light truck tires by the ambient grinding method. GTR shall not exceed 1/16 in. (2 mm) in any dimension and shall contain no free metal particles or other materials. A mineral powder (such as talc) meeting the requirements of AASHTO M 17 may be added, up to a maximum of four percent by weight of GTR to reduce sticking and caking of the GTR particles. When tested in accordance with Illinois modified AASHTO T 27, a 50 g sample of the GTR shall conform to the following gradation requirements:

Sieve Size	Percent Passing
No. 16 (1.18 mm)	100
No. 30 (600 μm)	95 ± 5
No. 50 (300 μm)	> 20

Add the following to the end of Note 1. of article 1030.03 of the Standard Specifications:

“A dedicated storage tank for the Ground Tire Rubber (GTR) modified asphalt binder shall be provided. This tank must be capable of providing continuous mechanical mixing throughout by continuous agitation and recirculation of the asphalt binder to provide a uniform mixture. The tank shall be heated and capable of maintaining the temperature of the asphalt binder at 300 °F to 350 °F (149 °C to 177 °C). The asphalt binder metering systems of dryer drum plants shall be calibrated with the actual GTR modified asphalt binder material with an accuracy of ± 0.40 percent.”

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

“(c) RAP Materials (Note 3) .....1031”

Add the following note to 1030.02 of the Standard Specifications:

Note 3. When using reclaimed asphalt pavement and/or reclaimed asphalt shingles, the maximum asphalt binder replacement percentage shall be according to the most recent special provision for recycled materials.

**HMA MIXTURE DESIGN REQUIREMENTS (D-1)**

Effective: January 01, 2013

Revised: January 16, 2013

**1) Design Composition and Volumetric Requirements**

Revise Article 1030.04(a)(1) of the Standard Specifications to read.

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

High ESAL, MIXTURE COMPOSITION (% PASSING) <sup>1/</sup>										
Sieve Size	IL-25.0 mm		IL-19.0 mm		IL-12.5 mm		IL-9.5 mm		IL-4.75 mm	
	min	max	min	max	min	max	min	max	min	max
1 1/2 in. (37.5 mm)		100								
1 in. (25 mm)	90	100		100						
3/4 in. (19 mm)		90	82	100		100				
1/2 in. (12.5 mm)	45	75	50	85	90	100		100		100
3/8 in. (9.5 mm)						89	90	100		100
#4 (4.75 mm)	24	42 <sup>2/</sup>	24	50 <sup>2/</sup>	28	65	28	65	90	100
#8 (2.36 mm)	16	31	20	36	28	48 <sup>3/</sup>	32	52 <sup>3/</sup>	70	90
#16 (1.18 mm)	10	22	10	25	10	32	10	32	50	65
#50 (300 μm)	4	12	4	12	4	15	4	15	15	30
#100 (150 μm)	3	9	3	9	3	10	3	10	10	18
#200 (75 μm)	3	6	3	6	4	6	4	6	7	9
Ratio Dust/Asphalt Binder		1.0		1.0		1.0		1.0		1.0 <sup>4/</sup>

1/ Based on percent of total aggregate weight.

2/ The mixture composition shall not exceed 40 percent passing the #4 (4.75 mm) sieve for binder courses with Ndesign ≥ 90.

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

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

Delete Article 1030.04(a)(4) of the Standard Specifications.

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

“(1) High ESAL Mixtures. The target value for the air voids of the HMA shall be 4.0 percent and for IL-4.75 it shall be 3.5 percent at the design number of gyrations. The VMA and VFA of the HMA design shall be based on the nominal maximum size of the aggregate in the mix, and shall conform to the following requirements.

VOLUMETRIC REQUIREMENTS High ESAL						
Ndesign	Voids in the Mineral Aggregate (VMA), % minimum					Voids Filled with Asphalt Binder (VFA), %
	IL-25.0	IL-19.0	IL-12.5	IL-9.5	IL-4.75 <sup>1/</sup>	
50	12.0	13.0	14.0	15	18.5	65 – 78 <sup>2/</sup>
70					65 - 75	
90						
105						

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

2/ VFA for IL-4.75 shall be 72-85%”

Delete Article 1030.04(b)(4) of the Standard Specifications.

Revise the Control Limits Table in Article 1030.05(d)(4) of the Standard Specifications to read.

“CONTROL LIMITS					
Parameter	High ESAL Low ESAL	High ESAL Low ESAL	All Other	IL-4.75	IL-4.75
	Individual Test	Moving Avg. of 4	Individual Test	Individual Test	Moving Avg. of 4
% Passing: <sup>1/</sup>					
1/2 in. (12.5 mm)	± 6 %	± 4 %	± 15 %		
No. 4 (4.75 mm)	± 5 %	± 4 %	± 10 %		
No. 8 (2.36 mm)	± 5 %	± 3 %			
No. 16 (1.18 mm)				± 4 %	± 3 %
No. 30 (600 μm)	± 4 %	± 2.5 %			
Total Dust Content No. 200 (75 μm)	± 1.5 %	± 1.0 %	± 2.5 %	± 1.5 %	± 1.0 %
Asphalt Binder Content	± 0.3 %	± 0.2 %	± 0.5 %	± 0.3 %	± 0.2 %
Voids	± 1.2 %	± 1.0 %	± 1.2 %	± 1.2 %	± 1.0 %
VMA	-0.7 % <sup>2/</sup>	-0.5 % <sup>2/</sup>		-0.7 % <sup>2/</sup>	-0.5 % <sup>2/</sup>

1/ Based on washed ignition oven

2/ Allowable limit below minimum design VMA requirement”



## 2) Design Verification and Production

Description. The following states the requirements for Hamburg Wheel and Tensile Strength testing for High ESAL, IL-4.75, and SMA hot mix asphalt (HMA) mixes during mix design verification and production.

When the options of Warm Mix Asphalt, Reclaimed Asphalt Shingles, or Reclaimed Asphalt Pavement are used by the Contractor, the Hamburg Wheel and tensile strength requirements in this special provision will be superseded by the special provisions for Warm Mix Asphalt, Reclaimed Asphalt Shingles, or Reclaimed Asphalt Pavement as applicable.

Mix Design Testing. Add the following to Article 1030.04 of the Standard Specifications:

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

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

(1)Hamburg Wheel Test criteria.

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

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

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

Production Testing. Add the following to Article 1030.06 of the Standard Specifications:

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

Basis of Payment. Revise the seventh paragraph of Article 406.14 of the Standard Specifications to read:

“For all mixes designed and verified under the Hamburg Wheel criteria, the cost of furnishing and introducing anti-stripping additives in the HMA will not be paid for separately, but shall be considered as included in the contract unit price of the HMA item involved.

No additional compensation will be awarded to the Contractor because of reduced production rates associated with the addition of the anti-stripping additive.”

**PUBLIC CONVENIENCE AND SAFETY (D-1)**

Effective: May 1, 2012

Revised: July 15, 2012

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

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

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

“The length of Holiday Period for Thanksgiving shall be from 5:00 AM the Wednesday prior to 11:59 PM the Sunday after”

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

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

**RECLAIMED ASPHALT PAVEMENT (RAP) AND RECLAIMED ASPHALT SHINGLES (RAS)  
(D-1)**

Effective: November 01, 2012

Revised: January 02, 2013

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 by 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. No additional RAP shall be added to the pile after the pile has been sealed. Stockpiles shall be sufficiently separated to prevent intermingling at the base. All stockpiles (including unprocessed RAP and Processed 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 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 RAP 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 inch 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 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/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. The Contractor shall construct individual, sealed RAS stockpiles meeting one of the following definitions. No additional RAS shall be added to the pile after the pile has been sealed. 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.** RAP/FRAP and RAS testing shall be according to the following.

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

(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) 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 whether RAP or 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 either during or after stockpiling.

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 stockpiled 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.

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 tests results shall be according to the following.

- (a) Evaluation of RAP/FRAP Test Results. All of the extraction results shall be compiled and averaged for asphalt binder content and gradation and, when applicable (for slag)  $G_{mm}$ . Individual extraction test results, when compared to the averages, will be accepted if within the tolerances listed below.

Parameter	RAP or FRAP	Conglomerate "D" Quality RAP
1 in. (25 mm)		$\pm 5 \%$
1/2 in. (12.5 mm)	$\pm 8 \%$	$\pm 15 \%$
No. 4 (4.75 mm)	$\pm 6 \%$	$\pm 13 \%$
No. 8 (2.36 mm)	$\pm 5 \%$	
No. 16 (1.18 mm)		$\pm 15 \%$
No. 30 (600 $\mu\text{m}$ )	$\pm 5 \%$	
No. 200 (75 $\mu\text{m}$ )	$\pm 2.0 \%$	$\pm 4.0 \%$
Asphalt Binder	$\pm 0.4 \%$ <sup>1/</sup>	$\pm 0.5 \%$
$G_{mm}$	$\pm 0.03$ <sup>2/</sup>	

1/ The tolerance for FRAP shall be  $\pm 0.3 \%$ .

2/ For slag and steel slag

If more than 20 percent of the individual sieves and/or asphalt binder content tests are out of the above tolerances, the RAP/FRAP shall not be used in HMA unless the RAP/FRAP representing the failing tests is removed from the stockpile. All test data and acceptance ranges shall be sent to the District for evaluation.

With the approval of the Engineer, the ignition oven may be substituted for extractions according to the Illinois Test Procedure, "Calibration of the Ignition Oven for the Purpose of Characterizing Reclaimed Asphalt Pavement (RAP)".

- (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. Individual test results, when compared to the averages, 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)	± 2.0 %
Asphalt Binder Content	± 1.5 %

If more than 20 percent of the individual sieves and/or asphalt binder content tests are out of the above tolerances, the RAS shall not be used in Department projects unless the RAS, RAP or FRAP representing the failing tests is removed from the stockpile. All test data and acceptance ranges shall be sent to the District for evaluation.

**1031.05 Quality Designation of Aggregate in RAP/FRAP.**

- (a) RAP. The aggregate quality of the RAP for homogenous, conglomerate, and conglomerate "D" quality stockpiles shall be set by the lowest quality of coarse aggregate in the RAP stockpile and are designated as follows.
- (1) RAP from Class I, Superpave (High ESAL)/HMA (High ESAL), or (Low ESAL) IL-9.5L surface mixtures are designated as containing Class B quality coarse aggregate.
  - (2) RAP from Superpave (High ESAL)/HMA (Low ESAL) IL-19.0L binder mixture is designated as Class D quality coarse aggregate.
  - (3) RAP from Class I, Superpave (High ESAL)/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 prequalified by the Department for the specified testing. The consultant 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 BMPR Aggregate Lab for MicroDeval Testing, according to Illinois Modified AASHTO T 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 RAS, RAP or FRAP in HMA.** The use of RAS, RAP or FRAP shall be a Contractor's option when constructing HMA in all contracts.

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

- (1) Coarse Aggregate Size (after extraction). The coarse aggregate in all RAP shall be equal to or less than the nominal maximum size requirement for the HMA mixture to be produced.
- (2) Steel Slag Stockpiles. RAP/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). RAP/FRAP stockpiles for use in HMA surface mixtures (High and Low ESAL) shall have coarse aggregate that is Class B quality or better. RAP/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. RAP/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. RAP/FRAP stockpiles for use in HMA shoulders and stabilized subbase (HMA) shall be RAP, 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) RAP/FRAP and/or RAS Usage Limits. Type 1 or Type 2 RAS may be used alone or in conjunction with RAP or FRAP in HMA mixtures up to a maximum of 5.0% by weight of the total mix.



When the Contractor chooses the RAP option, the percentage of the percentage of virgin asphalt binder replaced by the asphalt binder from the RAP shall not exceed the percentages indicated in the table below for a given N Design:

**Max Asphalt Binder Replacement RAP Only**

Table 1

HMA Mixtures <sup>1/, 2/</sup>	Maximum % Asphalt Binder replacement (ABR)			
	Ndesign	Binder/Leveling Binder	Surface	Polymer Modified
30L		25	15	10
50		25	15	10
70		15	10	10
90		10	10	10
105		10	10	10
4.75 mm N-50				15
SMA N-80				10

1/ For HMA “All Other” (shoulder and stabilized subbase) N-30, the percent asphalt binder replacement shall not exceed 50% of the total asphalt binder in the mixture.

2/ When the asphalt binder replacement exceeds 15 percent, the high and low virgin asphalt binder grades shall each be reduced by one grade (i.e. 25 percent binder replacement would require a virgin asphalt binder grade of PG64-22 to be reduced to a PG58-28). When constructing full depth HMA and the ABR is less than 15 percent, the required virgin asphalt binder grade shall be PG64-28.

When the Contractor chooses either the RAS or FRAP option, the percent binder replacement shall not exceed the amounts indicated in the tables below for a given N Design.

**Max Asphalt Binder Replacement RAS or FRAP**

Table 2

HMA Mixtures <sup>1/, 2/</sup>	Level 1 - Maximum % ABR			
	Ndesign	Binder/Leveling Binder	Surface	Polymer <sup>3/, 4/</sup> Modified
30L		35	30	15
50		30	25	15
70		30	20	15
90		20	15	15
105		20	15	15
4.75 mm N-50				25
SMA N-80				15

1/ For HMA “All Other” (shoulder and stabilized subbase) N-30, the percent asphalt binder replacement shall not exceed 50% of the total asphalt binder in the mixture.

2/ When the asphalt binder replacement exceeds 15 percent 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 percent binder replacement will require a virgin asphalt binder grade of PG64-22 to be reduced to a PG58-28). When constructing full depth HMA and the ABR is less than 15 percent, the required virgin asphalt binder grade shall be PG64-28.

3/ When the ABR for SMA is 15 percent or less, the required virgin asphalt binder grade shall be SBS PG76-22.

4/ When the ABR for IL-4.75 mix is 15 percent or less, the required virgin asphalt binder grade shall be SBS PG76-22. When the ABR for the IL-4.75 mix exceeds 15 percent, the virgin asphalt binder grade shall be SBS PG70-28.

When the Contractor chooses the RAS with FRAP combination, the percent asphalt binder replacement shall split equally between the RAS and the FRAP, and the total replacement shall not exceed the amounts indicated in the tables below for a given N Design.

Max Asphalt Binder Replacement RAS and FRAP Combination  
 Table 3

HMA Mixtures <sup>1/, 2/</sup>	Level 2 - Maximum % ABR		
Ndesign	Binder/Leveling Binder	Surface	Polymer Modified <sup>3/, 4/</sup>
30L	50	40	30
50	40	35	30
70	40	30	30
90	40	30	30
105	40	30	30
4.75 mm N-50			40
SMA N-80			30

1/ For HMA “All Other” (shoulder and stabilized subbase) N-30, the percent asphalt binder replacement shall not exceed 50% of the total asphalt binder in the mixture.

2/ When the binder replacement exceeds 15 percent 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 percent binder replacement will require a virgin asphalt binder grade of PG64-22 to be reduced to a PG58-28).

3/ When the ABR for SMA is 15 percent or less, the required virgin asphalt binder shall be SBS PG76-22. When the ABR for SMA exceeds 15%, the virgin asphalt binder grade shall be SBS PG70-28.

4/ When the ABR for IL-4.75 mix is 15 percent or less, the required virgin asphalt binder grade shall be SBS PG76-22. When the ABR for the IL-4.75 mix exceeds 15 percent, the virgin asphalt binder grade shall be SBS PG70-28.

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

All HMA mixtures will be required to be tested, prior to submittal for Department verification, according to Illinois Modified AASHTO T324 (Hamburg Wheel) and shall meet the following requirements:

Asphalt Binder Grade	# Repetitions	Max Rut Depth (mm)
PG76-XX	20,000	12.5
PG70-XX	20,000	12.5
PG64-XX	10,000	12.5
PG58-XX	10,000	12.5
PG52-XX	10,000	12.5
PG46-XX	10,000	12.5

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

For IL 4.75 mm Designs (N-50) the maximum rut depth is 9.0 mm at 15,000 repetitions.

**1031.08 HMA Production.** All HMA mixtures shall be sampled within the first 500 tons (450 metric tons) on the first day of production or during start up with a split reserved for the Department. The mix sample shall be tested according to the Illinois Modified AASHTO T 324 and shall meet the requirements specified herein. Mix production shall not exceed 1500 tons (1350 metric tons) or one day's production, whichever comes first, until the testing is completed and the mixture is found to be in conformance. The requirement to cease mix production may be waived if the plant produced mixture demonstrates conformance prior to start of mix production for a contract.

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, RAP 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 the RAS, RAP and FRAP control tolerances or QC/QA test results require corrective action, the Contractor shall cease production of the mixture containing RAs, RAP or FRAP and either switch to the virgin aggregate design or submit a new RAS, RAP or FRAP design.

- (a) RAP/FRAP. The coarse aggregate in all RAP/FRAP used shall be equal to or less than the maximum size requirement for the HMA mixture being produced.

(b) 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.

(c) RAS, RAP and FRAP. HMA plants utilizing RAS, RAP and FRAP 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, RAP 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, RAP and FRAP material as a percent of the total mix to the nearest 0.1 percent.
- h. Aggregate RAS, RAP and FRAP moisture compensators in percent as set on the control panel. (Required when accumulated or individual aggregate and RAS, RAP 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)

(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, RAP 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, RAP 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 Shoulders.** 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.
- (b) Gradation. One hundred percent of the RAP material shall pass the 1 1/2 in. (37.5mm) sieve. The RAP material shall be reasonably well graded from coarse to fine. RAP material that is gap-graded, FRAP, or single sized will not be accepted for use as Aggregate Surface Course and Aggregate Shoulders."

## **ADJUSTMENTS AND RECONSTRUCTIONS**

Effective: March 15, 2011

Revise the first paragraph of Article 602.04 to read:

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

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

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

Revise Article 603.05 to read:

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

Revise Article 603.06 to read:

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

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

Revise the first sentence of Article 603.07 to read:

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

## **STAGING AND INTERCHANGE RESTRICTIONS**

Prior to the actual beginning and completion of the various stages of construction and traffic protection, the Contractor will be required to provide lane closures and barricade systems, for preparation work such as pavement marking removal, temporary lane marking, placing temporary concrete barrier, relocating existing guardrail, etc. These lane closures and barricade systems, including barricades, drums, cones, lights, signs, flaggers etc. shall be provided in accordance with details in the plans and these Special Provisions and as approved by the Engineer. The cost of this work will not be paid for separately but shall be considered included in the contract lump sum price for **TRAFFIC CONTROL AND PROTECTION (EXPRESSWAYS).**

## **LANE AND RAMP CLOSURES**

Prior to and after stage construction, temporary closures of I-290 will only be permitted at night during the allowable hours as listed in the Special Provision "Keeping the Expressway Open to Traffic".

For all ramp closures the Contractor shall furnish and install signage per District Detail TC-08, as directed by the Engineer.

The Contractor shall coordinate the work such that no two (2) adjacent entrance or exit ramps in one direction of the expressway are closed at the same time. The closing of ramps, which are used as the detour route for other roadways or ramps, is prohibited. Should the Contractor fail to completely open, and keep open, the ramps to traffic in accordance with the above limitations, the Contractor shall be liable to the Department for liquidated damages as noted under the Special Provision, "Failure to Open Traffic Lanes to Traffic".

The Contractor shall submit to the Department two (2) weeks ahead of time, in writing, the starting date for each of the extended ramp and/or lane closures. Approval from the Department is required prior to closing the ramp and/or lanes. Should the Contractor fail to complete the work and reopen the ramp to traffic within the allowable time limit, the Contractor shall be liable to the Department for liquidated damages as noted under FAILURE TO OPEN TRAFFIC LANES TO TRAFFIC

## **TRAFFIC STAGING**

The following is a brief description of the traffic staging, which will be required from the Contractor during the reconstruction of the expressway. The following description shall be correlated with the Maintenance of Traffic (MOT) details located in the Plans and these Special Provisions.

This suggested sequence of operations and summary for Traffic Staging does not, nor is it intended to, depict all the work that will be required by the Contractor for the maintenance of traffic during this Contract. This summary is given as an aid and guide for the Contractor's use to establish the necessary guidelines to insure a safe and as smooth as possible traffic operation during the duration of the Contract.

Stage 1A:

- All COMED, AT&T, OUC, OEMC and 911 emergency unit utilities to be relocated by others. The removal and replacement of the existing utilities shall be coordinated and at the discretion of utility agencies.
- Begin 60" combined sewer relocation. All connections shall be made to minimize any traffic disruption along the local roads, mainlines and ramps.
- Begin watermain relocation. Install temporary soil retention systems as required. All fittings and connections shall be made to minimize any traffic disruption along the local roads, mainlines and ramps.
- Bulkhead and fill tunnel at north end of Halsted Street Bridge to the extent shown in the Plans. Work done shall be performed utilizing short term, off road closure operations per the highway standards.
- Relocate existing ITS lines to the CTA side of median barriers along EB and WB I-290.
- Remove the east half of the existing Halsted Street Bridge superstructure all piers but Pier 1 and approaches.
- Demolition and reconstruction of Halsted Street Bridge (SN 016-1716) piers and superstructure adjacent to the CTA shall be coordinated with the CTA. CTA track access is allowed during off-peak hours only. All CTA track access shall be coordinated and performed in accordance to the discretion of the CTA. Refer to "CTA flagging and coordination" special provision.
- The construction of Halsted Street Bridge will be staged. Staging construction shall follow the structural Plans.
- Construct all of the east half substructures except for Pier 1.
- The construction of the SN 016-1716 substructures shall be sub-staged whenever possible to maximize the work zone along the mainlines.
- Remove existing Harrison Street bridge approaches, superstructure, piers and abutments as shown in the Plans. Begin reconstruction of the Harrison Street Bridge (SN 016-1713) pier and abutments.
- Begin construction of retaining wall 016-1802.

Stage 1B:

- Construct the substructure of Pier 1.
- Upon completion of Pier 1, erect the superstructure on the east half of the Halsted Street Bridge.
- Construct deck and all other superstructure components except for the east sidewalk and parapet.
- Continue construction of Harrison Street Bridge.
- Continue construction of retaining wall 016-1802.



Stage 2A:

- Remove the west half of the existing Halsted Street Bridge superstructure and approaches including existing ITS and lighting as shown in the Plans.
- Demolition and reconstruction of Halsted Street Bridge (SN 016-1716) piers and superstructure adjacent to the CTA shall be coordinated with the CTA. CTA track access is allowed during off-peak hours only. All CTA track access shall be coordinated and performed in accordance to the discretion of the CTA. Refer to “CTA flagging and coordination” special provision.
- Reconstruct Halsted Street Bridge Pier 1 and south abutment limits as shown in in the Plans.
- Construct Temporary Bridge for pedestrian access to the Halsted Street CTA Station.
- Relocate duct bank to east half of the Halsted Street Bridge.
- Complete the reconstruction of the Harrison Street Bridge (SN 016-1713) pier and abutments.
- Begin reconstruction of Harrison Street Bridge superstructure and approaches.
- Continue construction of retaining wall 016-1802.

Stage 2B:

- Remove Temporary Bridge during the Halsted Street Bridge girder erection and deck construction.
- Complete the reconstruction of the west half of Halsted Street Bridge (SN 016-1716) including all piers, abutments, superstructure and approaches as shown in the Plans.
- Complete the reconstruction of the Harrison Street Bridge superstructure and approaches.
- Complete the construction of retaining wall 016-1802.
- Complete the construction of retaining wall 016-1802.
- Re-grade the embankment along ES Ramp and the retaining wall.

Stages 3A-3C:

- Complete the reconstruction of the Harrison Street Bridge superstructure and approaches.
- Complete the remaining portions of the east of Halsted Street Bridge work includes construction of east sidewalk, parapet railing and decorative fence.
- Erect CTA canopy structure.

## **MAINTENANCE OF ROADWAYS**

Effective: September 30, 1985

Revised: November 1, 1996

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

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

## **TRAFFIC CONTROL AND PROTECTION (ARTERIALS)**

Effective: February 1, 1996

Revised: March 1, 2011

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

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

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

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

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

## **TRAFFIC CONTROL PLAN**

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

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

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

STANDARDS: 701101, 701106, 701301, 701311, 701400, 701401, 701402, 701406, 701411, 701421, 701422, 701423, 701446, 701501, 701601, 701701, 701801, 701901, 704001

DETAILS: Maintenance of Traffic – General Notes, Narrative, Typical Sections, Stages 1A, 1B, 2A, 2B, 3A, 3B and 3C, TC-09, TC-10, TC-12, TC-17, TC-18, TC-21, TC-24, TC-27 and MUTCD TA-36.

### **SPECIAL PROVISIONS:**

Traffic Control Plan,

- Traffic Control and Protection (Arterials),
- Public Convenience and Safety,
- Keeping the Expressway Open to Traffic,
- Failure to Open Traffic Lanes to Traffic
- Traffic Control Surveillance (Expressways),
- Temporary Information Signing,
- Traffic Control for Work Zone Areas,
- Traffic Control and Protection Expressways,
- Staging and Interchange Restrictions,
- Pavement Marking Removal (BDE),
- Traffic Control Deficiency Deduction (BDE)

**KEEPING THE EXPRESSWAY OPEN TO TRAFFIC**

Effective: March 22, 1996

Revised: June 17, 2013

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

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

**LOCATION: I-290: @ Halsted St. prior to Stage Construction**

WEEK NIGHT	TYPE OF CLOSURE	ALLOWABLE LANE CLOSURE HOURS		
Sunday - Thursday	1-Lane	8:00 PM	to	5:00 AM
	2-Lane	11:00 PM	to	5:00 AM
	3- Left Lane*	1:00 AM	to	5:00 AM
Friday	1-Lane	10:00 PM (Fri)	to	8:00 AM (Sat)
	2-Lane	11:59 PM (Fri)	to	6:00 AM (Sat)
	3- Left Lane*	NOT		ALLOWED
Saturday	1-Lane	10:00 PM (Sat)	to	10:00 AM (Sun)
	2-Lane	11:59 PM (Sat)	to	8:00 AM (Sun)
	3- Left Lane*	1:00 AM (Sun)	to	7:00 AM (Sun)

**LOCATION: I-290: @ Halsted St. During Stage Construction**

WEEK NIGHT	TYPE OF CLOSURE	ALLOWABLE LANE CLOSURE HOURS		
Sunday - Thursday	1-Lane	11:00 PM	to	5:00 AM
	2-Left Lane*	1:00 AM	to	5:00 AM
Friday	1-Left Lane	11:59 PM (Fri)	to	6:00 AM (Sat)
	2-Left Lane*	NOT	to	ALLOWED
Saturday	1-Lane	11:59 PM (Sat)	to	8:00 AM (Sun)
	2-Left Lane*	1:00 AM (Sat)	to	7:00 AM (Sun)

\* 3 lane closures will only be allowed from the left & are only approved for specific operations.

**LOCATION: I-90/94 Dan Ryan: Roosevelt to I-290**

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

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

Narrow lanes and permanent shoulder closures will not be allowed between Dec. 1<sup>st</sup> and April 1<sup>st</sup>.

Full Expressway Closures will only be permitted for a maximum of 15 minutes at a time during the low traffic volume hours of 1:00 A.M. to 5:00 A.M. Monday thru Friday and from 1:00 A.M. to 7:00 A.M. on Sunday. During Full Expressway Closures, the Contractor will be required to close off all lanes except one, using Freeway Standard Closures. Police forces should be notified and requested to close off the remaining lane at which time the work item may be removed or set in place. The District One Traffic Operations Department **shall be** notified (847-705-4151) at least 3 working days (weekends and holidays DO NOT count into this 72 hours notification) in advance of the proposed road closure and will coordinate the closure operations with police forces.

All stage changes requiring the stopping and/or the pacing of traffic shall take place during the allowable hours for Full Expressway Closures and shall be approved by the Department.

All daily lane closures shall be removed during adverse weather conditions such as rain, snow, and/or fog and as determined by the Engineer.

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

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

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

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

### **ADDITIONAL INSURED**

Add the following paragraph at the end of Article 107.27 – Insurance, of the Standard Specifications for Road and Bridge Construction dated January 1, 2012:

The Contractor shall name The Board of Trustees of the University of Illinois, its elected and appointed trustees, officers and officials, employees, agents, successors, and assignees as additional insured in the Contractor's comprehensive general liability insurance and all risk property insurance policies.

The Contractor and the Engineer shall mail, by certified mail, an executed copy of the Certificate of Insurance to the University of Illinois at Chicago (UIC) prior to the start of construction on this project noted above. The address will be provided by the Engineer.

All costs related to this requirement will be paid for under Article 109.04 – Payment for Extra Work.

### **FAILURE TO OPEN TRAFFIC LANES TO TRAFFIC**

Effective: March 22, 1996

Revised: February 9, 2005

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

I-290 and Ramps: All Stages  
One lane or ramp blocked = \$1,700 /15 min.  
Two lanes blocked = \$3,500 /15 min.

I-90/94 and Ramps: All Stages  
One lane or ramp blocked = \$1,700 /15 min.  
Two lanes blocked = \$3,500 /15 min.

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

### **TRAFFIC CONTROL SURVEILLANCE, EXPRESSWAYS**

Effective: 10/25/95

Revised: 1/9/98

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

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

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

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

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

### **TEMPORARY INFORMATION SIGNING**

Effective: November 13, 1996

Revised: January 02, 2007

**Description.** This work shall consist of furnishing, installing, maintaining, relocating for various states of construction and eventually removing temporary informational signs. This also includes the Advanced Warning Sign for use on arterial roads as described herein. These signs may be ground mounted, skid mounted, truss mounted, bridge mounted or overlaid sign panels which cover portions of existing signs.

**Materials.** Materials shall be according to the following Articles of Division 1000 - Materials:

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

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

Note 2 Type A sheeting can be used on the plywood base.

Note 3 All sign faces shall be Type A except all orange signs shall meet the requirements of Article 1106.01.

Note 4 The overlay panels shall be 0.08 inch (2 mm) thick.

### **GENERAL CONSTRUCTION REQUIREMENTS**

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



Signs which are placed along the roadway and/or within the construction zone shall be installed according to the requirements of Article 720.04. The signs shall be 7 ft. (2.1 m) above the near edge of the pavement and shall be a minimum of 2 ft. (600 mm) beyond the edge of pavement. A minimum of three (3) posts shall be used.

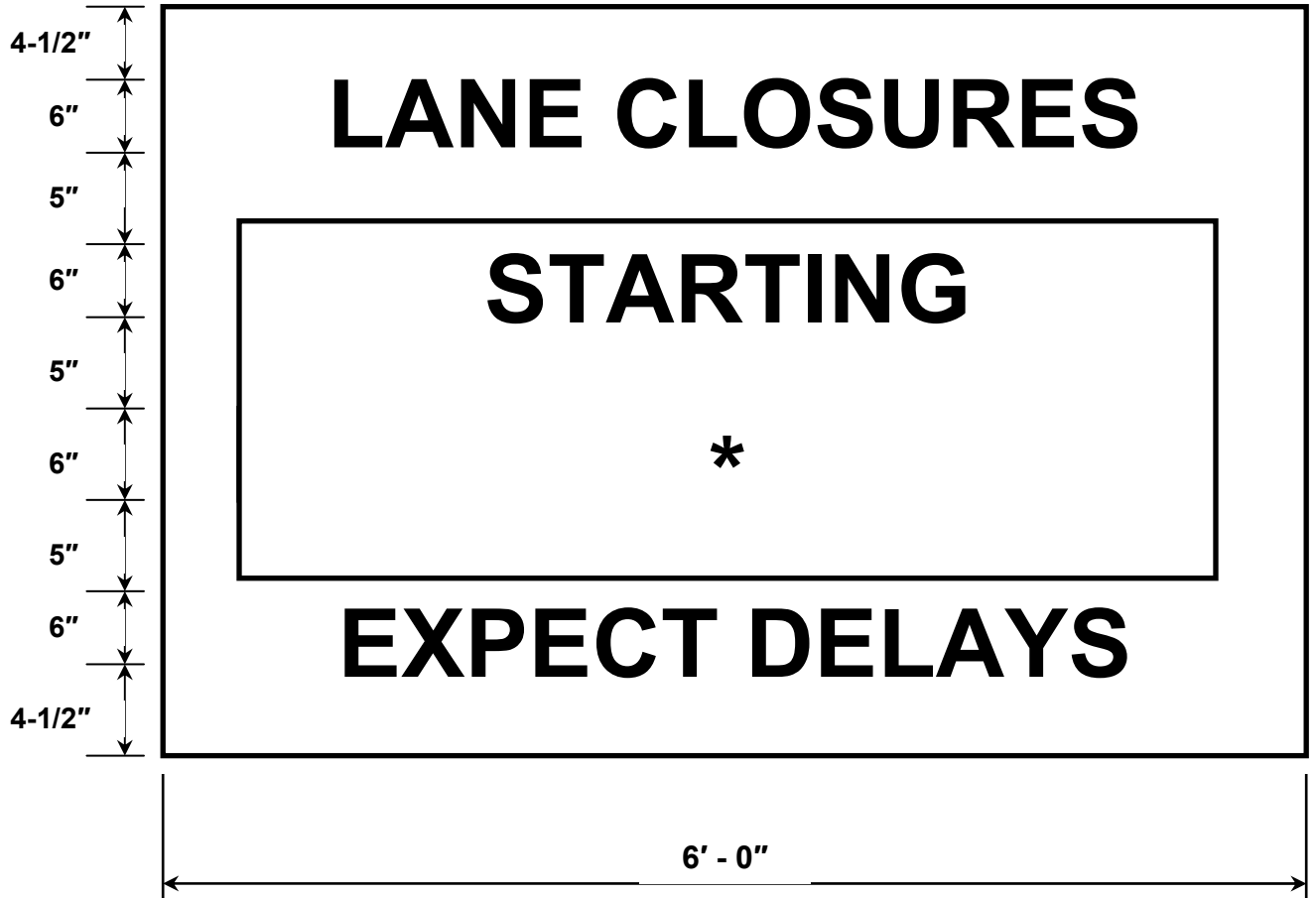
The attachment of temporary signs to existing sign structures or sign panels shall be approved by the Engineer. Any damage to the existing signs due to the Contractor's operations shall be repaired or signs replaced, as determined by the Engineer, at the Contractor's expense.

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

Method of Measurement: This work shall not be measured for payment.

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

Basis of Payment. This work shall be paid for at the contract unit price per square foot for TEMPORARY INFORMATION SIGNING, which price shall be full compensation for all labor, equipment and materials required for performing the work as herein specified.



\* Contractor shall provide overlay panel with the date for Start of lane closure. Signs shall be erected a minimum of one (1) week in advance of the start of the work. Overlay panel shall be removed soon after start of construction.

**ADVANCED WARNING SIGN DETAIL**  
**FOR ARTERIAL TRAFFIC**

## **TRAFFIC CONTROL FOR WORK ZONE AREAS**

Effective: 9/14/95

Revised: 1/1/07

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

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

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

## **TRAFFIC CONTROL AND PROTECTION (EXPRESSWAYS)**

Effective: 3/8/96

Revised: 6/5/13

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

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

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

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

Additional requirements for traffic control devices shall be as follows.

(a) Traffic Control Setup and Removal. The setting and removal of barricades for the taper portion of a lane closure shall be done under the protection of a vehicle with a truck/trailer mounted attenuator and arrow board. The attenuator vehicle shall be positioned in the live lane that is being closed or opened in advance of the workers and shall have the arrow panel directing traffic to the adjacent open lane. Failure to meet this requirement will be subject to a Traffic Control Deficiency charge. The deficiency will be calculated as outlined in Article 105.03 of the Standard Specifications and the Traffic Control Deficiency Deduction (BDE special provision). Truck/trailer mounted attenuators shall comply with Article 1106.02(g) or shall meet the requirements of NCHRP 350 Test Level 3 with vehicles used in accordance with manufacturer's recommendations and requirements.

(b) Sign Requirements

(1) Sign Maintenance. Prior to the beginning of construction operations, the Contractor will be provided a sign log of all existing signs within the limits of the construction zone. The Contractor is responsible for verifying the accuracy of the sign log. Throughout the duration of this project, all existing traffic signs shall be maintained by the Contractor. All provisions of Article 107.25 of the Standard Specifications shall apply except the third paragraph shall be revised to read: "The Contractor shall maintain, furnish, and replace at his own expense, any traffic sign or post which has been damaged or lost by the Contractor or a third party. The Contractor will not be held liable for third party damage to large freeway guide signs".

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

a. Existing Speed Limit of 55mph or higher. The initial work zone speed limit assembly, located approximately 3200' before the closure, and shall be 55mph as shown in 701400. Additional work zone 45mph assemblies shall be used as required according to Article 701.14(b) and as shown in the Highway Standards and plans. WORK ZONE SPEED LIMIT 55 PHOTO ENFORCED assemblies may be omitted when this assembly would normally be placed within 1500 feet of the END WORK ZONE SPEED LIMIT sign.

- b. Existing Speed Limit of 45mph. The advance 55mph work zone speed limit assembly shown in 701400 shall be replaced with a 45mph assembly. Additional work zone 45mph assemblies shall be used as required according to Article 701.14(b) and as shown in the Highway Standards and plans. WORK ZONE SPEED LIMIT 55 PHOTO ENFORCED assemblies shall be eliminated in all cases. END WORK ZONE SPEED LIMIT signs are required.
- (3) Exit Signs. The exit gore signs as shown in Standard 701411 shall be a minimum size of 48 inch by 48 inch with 12 inch capital letters and a 20 inch arrow. EXIT OPEN AHEAD signs shown in Standard 701411 shall be a minimum size of 48 inch by 48 inch with 8 inch capital letters.
- (4) Uneven Lanes Signs. The Contractor shall furnish and erect "UNEVEN LANES" signs (W8-11) on both sides of the expressway, at any time when the elevation difference between adjacent lanes open to traffic equals or exceeds one inch. Signs shall be placed 500' in advance of the drop-off, within 500' of every entrance, and a minimum of every mile.
- (c) Drums/Barricades. Check barricades shall be placed in work areas perpendicular to traffic every 1000', one per lane and per shoulder, to prevent motorists from using work areas as a traveled way. Check barricades shall also be placed in advance of each open patch, or excavation, or any other hazard in the work area, the first at the edge of the open traffic lane and the second centered in the closed lane. Check barricades, either Type I or II, or drums shall be equipped with a flashing light.
- To provide sufficient lane widths (10' minimum) for traffic and also working room, the Contractor shall furnish and install vertical barricades with steady burn lights, in lieu of Type II or drums, along the cold milling and asphalt paving operations. The vertical barricades shall be placed at the same spacing as the drums.
- (d) Vertical Barricades. Vertical barricades shall not be used in lane closure tapers, lane shifts, exit ramp gores, or staged construction projects lasting more than 12 hours. Also, vertical barricades shall not be used as patch barricades or check barricades. Special attention shall be given, and ballast provided per manufacture's specification, to maintain the vertical barricades in an upright position and in proper alignment.
- (e) Temporary Concrete Barrier Wall. Prismatic barrier wall reflectors shall be installed on both the face of the wall next to traffic, and the top of sections of the temporary concrete barrier wall as shown in Standard 704001. The color of these reflectors shall match the color of the edgelines (yellow on the left and crystal or white on the right). If the base of the temporary concrete barrier wall is 12 inches or less from the travel lane, then the lower slope of the wall shall also have a 6 inch wide temporary pavement marking edgeline (yellow on the left and white on the right).

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

Basis of Payment.

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

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

$$\text{Adjusted contract price} = .25P + .75P [1 \pm (X - 0.1)]$$

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

Where: "X" =	$\frac{\text{Difference between original and final sum total value of all work items for which traffic control and protection is required}}{\text{Original sum total value of all work items for which traffic control and protection is required.}}$
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The value of the work items used in calculating the increase and decrease will include only items that have been added to or deducted from the contract under Article 104.02 of the Standard Specifications and only items which require use of Traffic Control and Protection.

- (b) The Engineer may require additional traffic control be installed in accordance with standards and/or designs other than those included in the plans. In such cases, the standards and/or designs will be made available to the Contractor at least one week in advance of the change in traffic control. Payment for any additional traffic control required will be in accordance with Article 109.04 of the Standard Specifications.
- (c) Revisions in the phasing of construction or maintenance operations, requested by the Contractor, may require traffic control to be installed in accordance with standards and/or designs other than those included in the plans. Revisions or modifications to the traffic control shown in the contract shall be submitted by the Contractor for approval by the Engineer. No additional payment will be made for a Contractor requested modification.
- (d) Temporary concrete barrier wall will be measured and paid for according to Section 704.
- (e) Impact attenuators, temporary bridge rail, and temporary rumble strips will be paid for separately.
- (f) Temporary pavement markings shown on the Standard will be measured and paid for according to Section 703 and Section 780.
- (g) All pavement marking removal will be measured and paid for according to Section 703 or Section 783.

- (h) Temporary pavement marking on the lower slope of the temporary concrete barrier wall will be measured and paid for as TEMPORARY PAVEMENT MARKING, 6".
  - (i) All prismatic barrier wall reflectors will be measured and paid for according to the Recurring Special Provision Guardrail and Barrier Wall Delineation.

## **ROAD CONSTRUCTION REPORTING AND SIGNING FOR VEHICLE WIDTH RESTRICTIONS**

### **Introduction**

The intent of this policy is to provide uniform width restriction signing and reporting in order to reduce the chances of oversized vehicles, particularly those operating under blanket permits, from becoming entrapped in construction zones.

### **Construction/Maintenance Projects Requiring Over Size and Over Weight Restrictions**

- a) Closures of any roadway, Rail Road crossing, Interstate or Freeway Ramps
- b) All road construction that restricts the actual measured opening to less than 17' 6".
- c) Any construction zone with characteristics that have the potential of creating delays and/or potentially hazardous conditions such as roadways with a high traffic volume or unnecessary merging situations. Any other condition that the Engineer deems necessary to ensure safety should be listed.

### **Measuring with Restrictions**

In order to ensure state-wide uniformity, the opening shall be measured as follows:

- a) Two fixed structures – Measurement shall be made between the narrowest points of the fixed structures. Fixed structures may include but are not limited to bridge railing, concrete barrier, cable rail, or guard rail.
- b) Fixed structure and non-fixed devices or equipment – Measurement shall be made between the two narrowest points of the fixed structure and non-fixed devices when such non-fixed devices cannot easily be moved to accommodate the overwidth load. Such devices or equipment may include snoopers truckers, barricades/cones/drums placed to keep traffic away from open holes in the pavement, arrow boards, dynamic message signs, etc.
- c) Construction near a fixed structure – Construction activities near a fixed structure may result in a reportable width restriction where is insufficient room for an overwidth load to safely move onto the structure

## Reporting

In order to provide timely information to truckers, all road construction or maintenance activities which result in measured openings for traffic of less than 17' 6" or which involve the closure of any roadway, railroad grade crossing or freeway ramp are to be reported to the Central Bureau of Operations at least 21 days in advance of the date of the restriction start date which may be different from the start date of the project itself. The reporting is to be on form OPER 2410. Note on the form if the restrictions will only be in effect during the time period of ½ hour before sunrise to ½ after sunset Monday through Friday and ½ hour before sunrise to noon on Saturday, or if they will be in effect at all times.

When using form OPER 2410, the restriction location on interstate routes or other freeways should be identified with mileposts and/or a distance from an identifiable location, such as an intersection of two routes. If the restriction is located a structure, identify the feature crossed. The location of restrictions on conventional highways should be identified with a distance from an identifiable locations, such as an intersection of two routes and the From Mile/To Mile fields left blank. If construction is located at a structure, identify the feature crossed. If there are multiple structures with different width restriction dimensions, each structure and restriction must be listed separately. This can be accomplished on the same form.

If the construction and/or width restriction start/stop dates change after being submitted, a revised OPER 2410 must be submitted.

**The width restriction dimension to be listed on form OPER 2410 and used on the width restriction signing should be the actual measured opening less 18". For example if the actual measured opening is 16' 3", the restriction dimension is to be reported and signed at 14' 9".**

A greater deduction than 18" may be taken if, in the opinion of the Engineer, it is warranted due to unusual geometrics or other operational considerations. The dimension listed on form OPER 2410 and used on the signing should reflect the greater deduction.

After completion, the form is to be e-mailed to the **IDOT ROAD INFO** mailbox.

Emergencies or any unusual construction restrictions or closures should be reported immediately.

- a) During Normal Business Hours: Call (217) 782-8551. Submittal of OPER 2410 by e-mail to **IDOT ROAD INFO** is still required.
- b) After Normal Business Hours/ Weekends/ Holidays: Call the Communications Center (Station 1) at (217) 782-2937. After calling Station 1, submit OPER 2410 by e-mail to **IDOT ROAD INFO** and fax a copy to the Communications Center at (217) 782-1927.



## **Signing**

Signing shall be provided whenever the actual measured restriction is less than 17' 6". W12-I102 signs should be placed prior to the beginning of the traffic control where the width restriction occurs. Advance signing (W12-I103) shall also be placed where the roadway intersects with the previous state route and with any major local routes where overwidth vehicles are likely to enter the highway. The advance signing must be visible to approaching traffic sufficiently in advance of the intersection to enable overwidth trucks to change direction. This may require the use of more than one advance sign at the intersection. The dimensions shown on the signing shall be the actual measured opening less 18" as noted previously.

## **ENGINEER'S FIELD OFFICE TYPE A (SPECIAL)**

This item shall consist of furnishing all utilities and maintaining in good condition the existing office space and all appurtenances included in it, including but not limited to all communication devices, internet service, water coolers, copy machines, printers, refrigerators, air conditioning and heating systems, water services, furniture, buildings and all appurtenances thereof located at 900 South Des Plaines Street, Chicago, for the exclusive use of the Engineer or Authorized Representative. The Office shall meet the requirements of Article 670.02 of the Standard Specifications. It is intended that the Contractor for Halsted/Harrison Street, Contract 60W26, takes over the maintenance of the Engineer's Field Office Type A (Special) upon the completion and release of the maintenance and handover of the Engineer's Field Office Type A (Special) by the Contractor for Morgan Street Project – Contract 60W25.

The office space shall be maintained and kept in a clean condition at all times. The Contractor shall provide janitorial and/or cleaning service for a minimum of twice a week. Windows and window blinds shall be cleaned as directed by the Engineer. Maintenance shall include, but not limited to supply of paper towels, soap, toilet paper, and other necessary supplies. No additional compensation will be allowed for providing this service.

The existing interior walls may require one (1) coat of paint, as directed by the Engineer, at no additional cost.

The Contractor shall be responsible for security of the field office building and is liable for damages incurred as a result of vandalism, theft, and other criminal activities. Broken doors, windows or other appurtenances shall be replaced at no additional cost.

Four (4) on-site sanitary facilities shall be maintained.

The Contractor will be responsible for systems maintenance repairs which shall include the heating, cooling, sanitary and water distribution systems and light bulb replacements.

The (10) fire extinguishers meeting City of Chicago requirements shall be maintained.

The Contractor will be responsible for snow removal from parking areas and sidewalks surrounding the building & repair parking area damages as directed by the Engineer, at no additional cost.

The Contractor shall pay the cost of any building or equipment inspections by the City of Chicago. The Contractor shall also pay all costs to comply with the maintenance type inspection findings.

One (1) office copier black and white/color that has full network connectivity for all multifunction such as print, copy, scan and fax. The printer will have the capability of printing and scanning high quality documents as well as 11X17 size papers. The copier shall be complete with automatic document feeder and sorter. The unit shall have the ability to perform scanning over the network with the ability to generate files in JPEG, TIFF and PDF formats. Also included is the maintenance (servicing and repair as required) and operating supplies (paper supply of required sizes, ink and toner).

Basis of Payment: The office space maintenance and related support services will be paid for on a monthly basis until the space is released by the Engineer. The Contractor will be paid at the contract bid price each month, provided the space is maintained, equipped, and utilities furnished at the direction of the Engineer. Payment will not be made when the contract is suspended in accordance with Article 108.07 of the Standard Specifications for failure of the Contractor to comply with the provisions of the contract. The space, fully equipped and maintained as specified herein, will be paid for at the contract unit price per calendar month or fraction thereof for ENGINEER'S FIELD OFFICE TYPE A (SPECIAL). This price shall include all utility costs and shall reflect the salvage value, if any, of the equipment and furniture which becomes the property of the Contractor after release by the Engineer, except that the Department will pay that portion of each monthly long distance telephone bill in excess of \$50.

The Contractor shall be responsible for the repair and maintenance of the field office and all its related appurtenances. No extra payment will be made for systems maintenance, repairs or for damages incurred as a result of vandalism, theft or other criminal activities.

## **STORM SEWERS & SEWER CONNECTIONS TO CITY OF CHICAGO SEWERS**

Effective: September 30, 1985

Revised: January 01, 2007

This work consists of constructing storm sewers or sewer connections to City of Chicago sewers, in accordance with Section 550 of the Standard Specifications and the details shown in the plans at the locations shown on the plans.

All storm sewers and sewer connections 21 inches (525 mm) in diameter and smaller shall be best quality tile socket pipe conforming to the specifications for Extra Strength Clay Pipe, ASTM C 700, except as otherwise specified on the plans. Sewer pipes shall be gasketed in such a manner as to produce a compression type joint conforming to the requirements of ASTM C 425.

All storm sewer 24 inches (600 mm) in diameter or larger shall be reinforced concrete pipe conforming to the requirements of C-76, Class-III, wall "B" with "O-Ring" joints. Joints for catch basin and inlet connections shall be packed with oakum, caulked and beveled off with portland cement mortar.

Basis of Payment. This work will be measured and paid for at the contract unit price per foot (meter) for STORM SEWER in accordance with Articles 550.09 and 550.10 of the Standard Specifications.

## **TEMPORARY PAVEMENT**

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

The Contractor shall use either Portland cement concrete (PCC) according to Sections 353 and 354 of the Standard Specifications or hot-mix asphalt (HMA) according to Sections 355, 356, 406 of the Standard Specifications, and other applicable PCC and 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. The Contractor shall furnish and construct Subbase Granular Material, Type B 4" under the temporary pavement in accordance with the Standard Specifications.

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

The Temporary Pavement shall remain in place unless otherwise noted on the Plans, and if so, the removal shall conform to Section 440 of the Standard Specification.

Method of Measurement. TEMPORARY PAVEMENT and SUBBASE GRANULAR MATERIAL, TYPE B 4" will be measured in place and the area computed in square yards.

Basis of Payment. This work will be paid for at the contract unit price per square yard for TEMPORARY PAVEMENT and SUBBASE GRANULAR MATERIAL, TYPE B 4".

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

### **SAND CUSHION, 4 INCH, (CDOT)**

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 coarse sand placement of 4" depth beneath proposed sidewalks, driveways, or other appurtenances as directed by the Engineer.

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 Engineer may require removal and replacement of this unsuitable material with coarse sand placement.

Construction Requirements. The method for placement and compaction of the coarse sand shall be to the satisfaction of the Engineer.

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

Basis of Payment. This work will be paid for at the contract unit price per square foot for SAND CUSHION, 4 INCH, (CDOT).

### **EXPLORATION TRENCH (SPECIAL)**

Description. This work consists of trench excavation and backfilling by the Contractor for the purpose of locating unknown objects and unforeseen conflicts at the corner of the between the proposed Harrison Street Bridge (SN 016-1713) west abutment and proposed retaining wall 13 (SN 016-1802).

General: The work shall be performed according to Section 213 of the "Standard Specifications". The exploration trench(s) shall be constructed at a location(s) as directed by the Engineer.

The trench shall be deep enough to expose the underground line, and the width of the trench shall be sufficient to allow proper investigation to determine if the line is in conflict with the current or future propose improvements. Any necessary bracing and/or earth retention system needed should be included as part of the work.

Requirements. After Engineer's inspection of the trench area, it shall be backfilled with either excavated material or trench backfill at the Engineer's direction. All spoil generated by backfilling with trench backfill will be removed daily by the Contractor at their expense. Exploration trench depth can be expected up to 25' from the existing ground.

Method of Measurement. The Contractor's responsibility to determine the vertical locations of utilities is not considered to be Exploration Trench and is not measured for payment. Trench Backfill, if required, will be measured as specified in the special provision for Trench Backfill. An estimated length of exploration trench is included in the summary of quantities to establish a unit price only. The exploration trench will be measured for payment in feet of actual trench constructed.

Basis of Payment. This work shall be paid for at the contract unit price per Foot for EXPLORATION TRENCH (SPECIAL) as herein specified. If required, granular backfill will be paid for at the contract unit price for TRENCH BACKFILL.

### **SELECT GRANULAR BACKFILL, SPECIAL**

Description. This work shall consist of backfilling at locations shown on the Plans.

Materials. Backfill shall be clean angular stone meeting IDOT Gradation requirements CA 6 and compacted in a manner approved by the Engineer.

Construction Requirements. Stone shall be placed in maximum 1 foot lifts. Each lift shall be compacted to achieve proper interlocking as determined by the Engineer.

Method of Measurement. SELECT GRANULAR BACKFILL, SPECIAL shall be measured for payment in cubic yards in place.

Basis of Payment. This work shall be measured and paid for at the contract unit price per cubic yard for SELECT GRANULAR BACKFILL, SPECIAL.

## **REMOVE AND REPLACE SIGN AND SUPPORTS**

Description. Work under these items consists of removing existing Sign Panels from barrier and retaining walls and removal of existing Sign Panel Assemblies which consist of mountings on barrier and retaining walls, mounted sign panels, sleeves, wedges, bases and other associated hardware. The Contractor must store and save all sign panels and sign pole assemblies, and associated materials designated on the Plans for REMOVE AND REPLACE SIGN AND SUPPORTS for later reinstallation on the project.

The Contractor will tag removed signs with the inventory number from the sign removal schedule of each sign panel or associated sign assembly. The Contractor must provide storage for the sign panels and sign panel assemblies until such time in the project that they can be reinstalled at the designated location on the proposed sign installation plan and schedule. Reinstallation of the sign panels and sign assemblies shall be in accordance with the specifications for sign panel installation contained within the Standard Specifications. The unit price for sign panel and sign pole assembly reinstallation shall include new hardware.

Method of Measurement. REMOVE AND REPLACE SIGN AND SUPPORTS will be measured for payment on the basis of each item (sign or sign panel assembly) removed and reinstalled.

Basis of Payment. REMOVE AND REPLACE SIGN AND SUPPORTS will be paid for at the contract unit price per each.

## **CONSTRUCTION ACCESS**

Description. Work under this item includes the placement of temporary materials to serve as a transition along Harrison Street between the pavement placed as proposed and existing pavement. This temporary work is expected to remain in place for a short duration, as the future work for the reconstruction of the bridge carrying Harrison Street over northbound I-90//94 is anticipated to begin almost immediately to the completion of the Harrison Street bridge reconstruction under this contract.

This temporary construction access ramp must be prepared in a way that completed pavement is not affected. The ramp must stay in use by CDWM personnel throughout a substantial portion of the future contract.

All work must conform to Section 416 of the IDOT Standard Specifications for Road and Bridge Construction.

Method of Measurement. CONSTRUCTION ACCESS will be measured for payment on the basis of each item constructed.

Basis of Payment. CONSTRUCTION ACCESS be paid for at the contract unit price per each.

## **DETECTABLE WARNINGS (SPECIAL)**

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

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 Engineer. All detectable warning systems shall be of the linear type.

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 Engineer.

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

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

Basis of Payment: This work will be paid for at the contract unit price per square foot for DETECTABLE WARNINGS (SPECIAL).

### **CONCRETE BARRIER WALL (SPECIAL)**

Description. This work shall consist of constructing a concrete barrier wall with reinforcement bars on a concrete barrier base as detailed in the Plans. This work also includes performing all notching as detailed in the Plans.

Construction Requirements. This work shall be done in accordance with the applicable portions of Section 637 of the Standard Specifications. The concrete barrier wall shall be constructed on a concrete barrier base as detailed in the Plans. The concrete barrier wall shall be constructed separately and not poured monolithically with the concrete barrier base.

Method of Measurement. CONCRETE BARRIER WALL (SPECIAL) shall be measured for payment in feet along the centerline of the barrier. The concrete barrier base will be paid for separately according to CONCRETE BARRIER BASE (SPECIAL). Notching of the concrete barrier wall will not be paid for separately, but shall be considered included in the cost of CONCRETE BARRIER WALL (SPECIAL).

Basis of Payment. This work will be paid for at the contract unit price per foot for CONCRETE BARRIER WALL (SPECIAL), which price shall include all equipment, labor, and materials necessary to construct the concrete barrier wall including all reinforcement bars in the concrete barrier wall and performing all notching as detailed in the Plans.

### **CONCRETE BARRIER TRANSITION (SPECIAL)**

Description. This work shall consist of constructing a concrete barrier transition between barriers of different design. The concrete barrier transition shall include reinforcement bars and be constructed on a concrete barrier base as detailed in the Plans. This work also includes performing all notching as detailed in the Plans.

Construction Requirements. This work shall be done in accordance with the applicable portions of Section 637 of the Standard Specifications. The concrete barrier transition shall be constructed on a concrete barrier base as detailed in the Plans. The concrete barrier transition shall be constructed separately and not poured monolithically with the concrete barrier base.

Method of Measurement. CONCRETE BARRIER TRANSITION (SPECIAL) shall be measured for payment in feet along the centerline of the transition. The concrete barrier base will be paid for separately according to CONCRETE BARRIER BASE (SPECIAL). Notching of the concrete barrier transition will not be paid for separately, but shall be considered included in the cost of CONCRETE BARRIER TRANSITION (SPECIAL).

Basis of Payment. This work will be paid for at the contract unit price per foot for CONCRETE BARRIER TRANSITION (SPECIAL), which price shall include all equipment, labor, and materials necessary to construct the concrete barrier transition including all reinforcement bars in the concrete barrier transition and performing all notching as detailed in the Plans.



### **CONCRETE BARRIER BASE (SPECIAL)**

Description. This work shall consist of constructing a concrete barrier base with reinforcement bars below a concrete barrier wall or concrete barrier transition as detailed in the Plans.

Construction Requirements. This work shall be done in accordance with the applicable portions of Section 637 of the Standard Specifications. The concrete barrier base shall be constructed as detailed in the Plans. The concrete barrier wall or concrete barrier transition shall be constructed separately and not poured monolithically with the concrete barrier base.

Method of Measurement. CONCRETE BARRIER BASE (SPECIAL) shall be measured for payment in feet along the centerline of the base. The concrete barrier wall and concrete barrier transition will be paid for separately according to CONCRETE BARRIER WALL (SPECIAL) and CONCRETE BARRIER TRANSITION (SPECIAL).

Basis of Payment. This work will be paid for at the contract unit price per foot for CONCRETE BARRIER BASE (SPECIAL), which price shall include all equipment, labor, and materials necessary to construct the concrete barrier base including all reinforcement bars in the concrete barrier base and those extending into the concrete barrier wall or concrete barrier transition.

### **TEMPORARY CONCRETE BARRIER (SPECIAL)**

Description. This work shall consist of furnishing, placing, maintaining, relocating, and removing precast concrete barrier with 5' high chain-link fencing with top tension wire on top of the precast concrete barrier at locations as shown on the Plans. This work shall also include the placement and removal of the chain-link fencing. This work shall be performed in accordance with Section 664 and Section 704 of the Standard Specifications.

The Contractor shall submit a catalog cut or details of the fence, mounting stands, hardware, and other appurtenances for approval by the Engineer.

The individual fence panels shall be securely fastened together and the stands or other mounting devices shall be permanently installed onto the temporary concrete barrier.

Method of Measurement. Temporary Concrete Barrier (Special) will be measured for payment in feet, along the total length of the temporary concrete barrier.

Basis of Payment. This work will be paid for at the contract unit price per foot for TEMPORARY CONCRETE BARRIER (SPECIAL), which price shall include furnishing, placing, maintaining and removing the temporary concrete barrier and chain-link fencing during construction.

### **TEMPORARY CONCRETE BARRIER (TO REMAIN PERMANENTLY)**

Description. This work shall consist of furnishing, placing, and maintaining precast concrete barrier at locations specified in the Plans. This work shall be completed in accordance with the applicable portions of Section 704 of the Standard Specifications and as noted herein. This work shall also include anchor and connection pins, where required.

Installation. The precast concrete barrier shall be installed according to Section 704.04 of the Standard Specifications except that each barrier unit shall be secured to the pavement or shoulder using six anchoring pins. The precast concrete barrier shall not be removed at the end of the contract. After the Contract is closed, the Contractor shall leave the existing barrier in place and ownership and maintenance of barrier shall be transferred over to the Department.

Method of Measurement. TEMPORARY CONCRETE BARRIER, (TO REMAIN PERMANENTLY) shall be measured for payment per foot.

Basis of Payment. This work shall be paid for at the contract unit price per foot for TEMPORARY CONCRETE BARRIER, (TO REMAIN PERMANENTLY), which price shall include all labor, equipment, and materials necessary to furnish and place precast concrete barrier, including anchoring as required.

### **REMOVE IMPACT ATTENUATORS, NO SALVAGE**

Description. This work shall consist of removing existing impact attenuators at locations as specified in the Plans.

Construction Requirement. When the Engineer determines the existing impact attenuators are no longer required, the installation shall be dismantled with all hardware becoming the property of the Contractor.

When impact attenuators have been anchored to the pavement, the anchor holes shall be repaired with rapid set mortar with only enough water to permit placement. Consolidation by rodding shall be used and the material shall be struck-off flush.

Method of Measurement and Basis of Payment. This work will be measured for payment at the contract unit price per each for REMOVE IMPACT ATTENUATORS, NO SALVAGE, where each is defined as one complete installation.

## **REMOVE OVERHEAD SIGN STRUCTURE - WALKWAY**

Description. This work shall consist of removing walkways, walkway supports, and hardware connected to overhead sign structures.

Construction Details. The Contractor shall remove the existing walkway completely from the sign truss or bridge mounted sign including its supports. The Contractor shall notify the Engineer 72 hours in advance of any walkway removal activities planned to take place over the Expressway. All items shall be transported and disposed of offsite, unless otherwise directed by the Engineer.

Method of Measurement. The length of walkway removed from a structural sign truss or bridge mounted sign, including all brackets, hardware, and any additional materials attaching walkway to the structure, not including brackets supporting existing sign, will be measured for payment, in units per foot.

Basis of Payment. This work will be paid for at the contract unit price per foot for REMOVE OVERHEAD SIGN STRUCTURE – WALKWAY which price shall include all equipment, materials and labor required to remove and dispose of designated walkway, supports, and corresponding hardware.

## **SIGN PANEL - TYPE 1 (SPECIAL)**

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

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

### Submittals.

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

B. Materials:

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

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

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

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

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

Basis of Payment. This work will be paid for at the Contract Unit Price per square foot of SIGN PANEL TYPE 1, (SPECIAL) for a fabricated, furnished and delivered sign.

## **STEEL POSTS, SPECIAL**

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 10 feet and 8 inches in length and the poles installed using drill method shall be 9 feet and 8 inches in length. The cost of wedges, sleeves, pole bases and all other required hardware to install poles is included in the cost of these items.

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

Finish: The poles must be galvanized, straight and have a smooth, black, uniform powder coating finish as specified below. The interior of the sign poles must be coated with a minimum of an 81% zinc rich primer. The exterior of the poles must be galvanized with material conforming to AASHTO M 120 with a minimum weight of 1.00 ounce per square foot. The weight of the exterior galvanizing may be reduced to 0.65 ounces per square foot of High Grade material conforming to AASHTO 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

or approved equal.

Pretreatment Process:

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

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

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

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

Powder Coating Process:

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

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

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

Sleeve and Locking Wedge:

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

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. A drawing detail as shown in Appendix I shall govern.

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 as shown in the drawings provided in the Appendix I of these specifications.

Bolt washers and nut: Stainless steel as specified in Article 1006.31a of the Standard Specifications. Include a ½" x 4-1/2" carriage bolt with two 1" flat washers and a ½"-13 full height hex nylon locknut.

Anchor Bolt: Galvanized steel expansion anchors conforming to Article 1006.09 of the Standard Specifications. Red Head #1236 (½"x 3-3/4"). Furnish three (3) per each sign base provided.

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

Submittals/Material Acceptance: 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.

Installation:

All installation shall be performed in accordance with Article 720.04 of the Standard Specifications.

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

Drill Method: This method shall be used to install all poles in pavement, sidewalk, and bridge decks. The base will be secured to the concrete surface by steel expansion anchors and must be leveled by using stainless steel washers as shims at the anchor bolt locations and under the base castings. The sign pole will be installed into the cast iron base and locked in place with a carriage bolt with two flat washers and a nylon lock nut as shown in the Appendix I. 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.

**Warranty:**

Manufacturer's warranties shall be 5 (five) years. The final punch list completion and acceptance date constitutes the start of the warranty period.

Method of Measurement. STEEL POSTS, SPECIAL shall be measured for payment for each pole furnished and installed.

Basis of Payment. This work will be paid for at the contract unit price per each for STEEL POSTS, SPECIAL which shall include the poles, all sleeves, locking wedges, bases and all other required hardware to complete the installation of poles.

## **TEMPORARY EPOXY PAVEMENT MARKING**

Description. This work shall consist of furnishing, installing, and maintaining Temporary Epoxy Pavement Markings.

Material. Materials shall be according to Article 1095.04 of the Standard Specifications.

Equipment. Equipment shall be according to Article 1105.02.

Construction Requirements. Prior to application a surface preparation adhesive shall be applied to a clean, dry road surface. The pavement shall be cleaned by a method of approved by the Engineer to remove all dirt, grease, glaze, or other material that would reduce the adhesion of the markings with minimum or no damage to the pavement surface. No markings shall be placed until the Engineer approves the cleaning. The Temporary Epoxy Pavement Marking shall be placed according to the applicable portions of Article 780.09.

Method of Measurement and Basis of Payment. This work will be paid for at the contract unit price per foot for TEMPORARY EPOXY PAVEMENT MARKING of the line width specified and/or per square foot (square meter) for TEMPORARY EPOXY PAVEMENT MARKING-LETTERS AND SYMBOLS.

Removal will be paid at the contract unit price per square foot (square meter) for WORK ZONE PAVEMENT MARKING REMOVAL.

When temporary pavement marking is shown on the Standard, the cost of the temporary pavement marking will be included in the cost of the Standard.

### **CONCRETE MEDIAN (SPECIAL)**

Description. This work consists of constructing a concrete median according to the details included in the Plans and in accordance with the applicable portions of Section 606 of the Standard Specifications.

Method of Measurement. CONCRETE MEDIAN (SPECIAL) 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 CONCRETE MEDIAN (SPECIAL), which price includes all labor and equipment necessary to construct the median.

### **COMBINATION CURB AND GUTTER TYPE B V.12 (CDOT)**

Description: Work under this item shall be performed according to Section 606 of the IDOT Standard Specifications for Road and Bridge Construction, and to the City of Chicago Department of Transportation Regulations for Openings, Construction and Repair in the Public Way. The work consists of constructing variable height Portland Cement Concrete (PCC) combination curb and gutter greater than 3" in height and less than 9" in height.

Materials: Materials shall meet the applicable requirements of Division 1000 of the Standard Specifications.

Construction Requirements: Meet applicable requirements of Section 606 of the Standard Specifications. Construct combination concrete curb and gutter, type B (special) at the locations, widths and thickness shown on the Plans.

Method of Measurement: COMBINATION CURB AND GUTTER TYPE B V.12 (CDOT) will be measured for payment in feet along the flow line of the gutter and along the face of the concrete curb, which measurement will include drainage castings incorporated in various curbs and curbs and gutters.

Basis of Payment: This work will be paid for at the contract unit price per foot for COMBINATION CURB AND GUTTER TYPE B V.12 (CDOT).



## **ORNAMENTAL FENCE, WROUGHT IRON**

Description. This work shall consist of furnishing and installing a new fence along Halsted Street just south of Van Buren Street to match the existing fence at the locations shown in the Plans including all posts, accessories, appurtenances, fittings, fasteners, braces, footings, backfill, labor and equipment required to install the fence.

Construction Requirements. This work shall be done in accordance with the applicable portions of Section 664 of the Standard Specifications. Fence post installation in soil shall be done using concrete footings having a minimum depth of 36 inches or as directed by the Engineer.

Materials. All new fence materials and style shall match the existing fence to be removed in kind to the satisfaction of the Engineer. In general, this fence shall be a wrought iron fence, painted black, and 4'-0" in height. Any modifications or substitutions will not be allowed unless previously agreed to by the Engineer.

Method of Measurement. ORANMENTAL FENCE, WROUGHT IRON shall be measured for payment in feet along the top of the fence from center to center of end post, including the length occupied by gates.

Basis of Payment. This work will be paid for at the contract unit price per foot for ORNAMENTAL FENCE, WROUGHT IRON, which price shall include all equipment, labor, and materials necessary to furnish and install the fence, including posts, accessories, appurtenances, fittings, fasteners, braces, footings, and backfill.

## **APPROACH SLAB REMOVAL**

Description. This work shall consist of the complete removal of the existing approach slabs including bituminous overlays, reinforcing bars, and sleeper slabs, at locations designated in the Plans and in accordance with the applicable portions of Sections 440 and 501 of the Standard Specifications.

This work shall also include the removal of existing timber piles and pile caps to at least 300mm (1 ft) below the proposed elevation of subgrade or ground surface within the area of construction and within the limits of the right of way when encountered. This work shall also include the removal of any mud jack cylinders encountered within the existing approach slabs.

The Contractor shall remove the existing approach slabs in a manner so as not to damage the adjacent structures that are to remain.

Method of Measurement. APPROACH SLAB REMOVAL shall be measured in place in square yards.

Basis of Payment. This work will be paid for at the contract unit price per square yard for APPROACH SLAB REMOVAL, which price shall include all labor and equipment necessary to remove and dispose of the entire approach slab pavement.

## **FENCE REMOVAL**

Description. This work shall consist of removing and disposing the existing fence of all kinds as shown in the Plans or otherwise directed by the Engineer.

Construction Requirements. No removal work shall be completed without the approval of the Engineer. All associated hardware and appurtenances of the existing fence including but not limited to post foundations, fittings, gates, post, and accessories, shall be removed off-site and disposed of by the Contractor in a legal disposal site. All postholes shall be backfilled and compacted to the satisfaction of the Engineer. Any part of the fence that is damaged that is not called out for to be removed shall be replaced at the Contractor's expense.

Method of Measurement. Fence removal shall be measured for payment in feet of FENCE REMOVAL and measured along the top of the fence from center to center of end post, including the length occupied by gates.

Basis of Payment. This work will be paid for at the contract unit price per foot for FENCE REMOVAL, which price shall include all equipment, labor, and materials necessary to remove and dispose of the fence, associated hardware, and appurtenances.

## **REMOVE GATE POSTS**

Description: This work shall consist of removing and disposing the existing gate posts at west driveway entrance of the Cermak Pumping Station.

Construction Requirements: No removal work shall be completed without the approval of the Engineer. All associated hardware and appurtenances of the existing posts shall be removed off-site and disposed of by the Contractor in a legal disposal site. All postholes shall be backfilled and compacted to the satisfaction of the Engineer.

Prior to commencing work under this Item, the Contractor shall verify the location of all existing utilities in the area. All work under this Item shall be executed in such a manner so as not to disturb or damage the existing utilities.

All materials removed under this Item shall become the property of the Contractor and shall be disposed of by the Contractor off the site and in a lawful manner meeting all IDOT Policies and Procedures.

Method of Measurement. Gate posts removal shall be measured for payment by each of the post removed.

Basis of Payment. The work under this Item will be paid for at the Contract unit price each for REMOVE GATE POSTS, as indicated on the Plans and as specified herein.

## **REMOVE EXISTING GATE**

Description: This work shall consist of removing and disposing the existing gate at the west driveway entrance of the Cermak Pumping Station in as shown in the Plans and as directed by the Engineer.

Construction Requirements: No removal work shall be completed without the approval of the Engineer. All associated hardware and appurtenances of the existing gate shall be removed off-site and disposed of by the Contractor in a legal disposal site. All postholes shall be backfilled and compacted to the satisfaction of the Engineer.

Method of Measurement. Gate removal shall be measured for payment by each of the gate removed.

Basis of Payment. The work under this Item will be paid for at the Contract unit price each for REMOVAL EXISTING GATE, as indicated on the Plans and as specified herein.

## **CONCRETE BARRIER REMOVAL**

Description. This work shall consist of the removal of existing concrete barrier wall along with any barrier wall base at locations shown on the Plans.

Construction Requirements. This work shall be done in accordance with the applicable portions of Section 440 of the Standard Specifications. The portion of the existing wall to be removed shall be saw cut with a concrete saw without causing damage to the portion of the existing concrete barrier wall to remain. The concrete saw shall be equipped with a diamond blade of sufficient size to saw cut reinforced concrete barrier wall full-depth and be capable of accurately maintaining cutting depth and alignment.

The Contractor shall be responsible for all damage to existing concrete barrier wall and other appurtenances to remain in place. All damage to these items shall be repaired or replaced at the Contractor's own expense, and to the satisfaction of the Engineer.

Method of Measurement. CONCRETE BARRIER REMOVAL shall be measured for payment in feet along the centerline of concrete barrier wall.

Saw cuts will not be measured for payment but shall be included in the cost of concrete barrier removal

Basis of Payment. This work shall be measured and paid for at the contract unit price per foot yard for CONCRETE BARRIER REMOVAL, which price shall include all labor, equipment and materials necessary to remove and dispose of the concrete barrier wall and concrete barrier wall base

## **COMBINED SEWER REMOVAL**

Description. This work will consist of the removal of combined sewers, including laterals.

Combined sewers shall be removed according to Article 551.03 of the "Standard Specifications"

Method of Measurement. This work shall be measured for payment according to Article 550.09 of the "Standard Specifications".

Excavation in rock will be measured for payment according to Article 502.12

Trench backfill for combined sewer removal will be measured for payment according to Article 208.03, except an addition will be made for one-half of the volume of the pipe removed.

Basis of Payment. This work will be paid for at the contract unit price per foot for COMBINED SEWER REMOVAL, of the diameter specified. TRENCH BACKFILL will be paid for separately.

Excavation in rock will be paid for according to Article 502.13.

Trench backfill will be paid for according to Article 208.04.

Removal and replacement of unsuitable material below plan bedding grade will be paid for according to Article 109.04.

## **REMOVE EXISTING VALVE AND VAULT**

Description. Work under this item will include the complete removal of existing City of Chicago Water Main vault structures as part of the relocation and reconstruction of the existing 54" water main from the Cermak Pumping Station. After the removal of all pipe, valves, fittings, taps and other water main elements, the brick or concrete structure must be broken down with the void in the affected area filled to grade.

Construction Requirements. No work shall proceed prior to the shutdown of any water main passing through or adjacent to the vault structure to be removed. This work will consist of removing the frame and cover of an existing vault structure, removal of valves, fittings, taps and other elements of the water system, breaking down the structure 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 vault 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 vault is in sidewalk or in pavement, the sidewalk or pavement will be included in other pay items. Trench backfill must be utilized to fill the void if pavement is proposed. If proposed structures, including water main vaults or sewer structures, or water main or sewer pipe are planned for a similar location as the structure to be removed, the Contractor may elect to utilize the void from the vault removal as excavation for proposed work. In this case, no backfill is necessary and any backfill for the proposed work will be considered part of those proposed items. Any frames, lids, valves, fittings, taps or other water main elements that are salvaged in reasonable condition in the opinion of the Engineer may be offered to the City of Chicago Department of Water Management. Any debris, including the frame, lid, valves, fittings, taps or other items must be disposed of off-site in an approved manner. The Contractor will pay for all disposal fees. If the vault removal is within an area of proposed pavement, trench backfill must be utilized as backfill. Trench backfill will be measured separately.

Method of Measurement. This work will be paid for per each vault removed including all existing water main pipe, valves, fittings, taps or other water main items. All backfill will be considered as part of the vault removal unless otherwise included within items that are placed within the area of the removed structure.

Basis of Payment. This work will be paid for at the contract unit price per each for REMOVE EXISTING VALVE AND VAULT which price will be payment in full for all labor and materials necessary to complete the work as described. Salvaging of any materials will be considered incidental to this item.

Trench backfill will be paid for according to Article 208.04.

## **REMOVE EXISTING VALVE AND VAULT (SPECIAL)**

Description. Work under this item will include the complete removal of the existing City of Chicago Water Main vault structure located adjacent to and partially beneath the shoulder pavement of ramps leading to I-90/94 as indicated on the Plans. This work is part of the relocation and reconstruction of the existing 54" water main from the Cermak Pumping Station. The existing structure is identified in record drawings included in the Plans. After the removal of all pipe, valves, electromechanical operators, fittings, taps, drains and other water main components, the vault structure must be broken down with all foundation elements cut off a minimum of one foot below the bottom of the existing structure. The proposed water main will be constructed in the same area of the existing structure. Trench backfill must be utilized to bring the excavation to subgrade with pavement restoration included in separate items. Topsoil and landscape restoration is considered included with the removal of the existing structure.

Construction Requirements. No work shall proceed prior to the shutdown of the 54" water main passing through the vault structure to be removed. The details of the existing vault structure are providing in record drawings included in the Plans. The top of the existing vault is assumed to be buried below existing shoulder, barrier wall and landscaping. The work will consist of all necessary pavement and wall removal, excavating a distance around the structure to provide access for the removal of all components of the vault structure. the removal of the top slab and any buried frame and cover, disconnection of any electric connections to the Cermak Pumping Station with coordination of the City of Chicago Department of Water Management, removal of valves, electromechanical operators, fittings, taps, drains and other elements of the water system, breaking down the structure walls, removing large debris, removal of foundation elements to a minimum of one foot below the existing bottom slab and backfilling the void with approved trench backfill. The portion of the excavation backfilled with bedding and backfill for the proposed water main is considered part of that item. All other backfill using trench backfill to subgrade is included in this item. Proposed pavement reconstruction to repair the excavation is included under separate items. Topsoil and landscape restoration outside of paved areas will not be paid for separately. For the portions of the vault removal within the area of proposed pavement, trench backfill must be utilized as backfill. Trench backfill will be measured separately.

Any frames, lids, valves, electromechanical operators, fittings, taps or other water main elements that are salvaged in reasonable condition in the opinion of the Engineer may be offered to the City of Chicago Department of Water Management. Any debris, including frames, lids, valves, electromechanical operators, fittings, taps, drains or other items must be disposed of off-site in an approved manner. The Contractor will pay for all disposal fees.

Method of Measurement. This work will be paid for per each vault excavated and removed including all existing water main pipe, frames, lids, valves, electromechanical operators, fittings, taps or other water main items. All backfill will be considered as part of the vault removal unless otherwise included within items that are placed within the area of the removed structure.

Basis of Payment. This work will be paid for at the contract unit price per each for REMOVE EXISTING VALVE AND VAULT (SPECIAL) which price will be payment in full for all labor and materials necessary to complete the work as described. Salvaging of any materials will be considered incidental to this item.

Trench backfill will be paid for according to Article 208.04.

## **FILLING VALVE VAULTS**

Description. Work under this item will include the abandonment of existing City of Chicago Water Main vault structures as part of the relocation and reconstruction of the existing 54" water main from the Cermak Pumping Station. Any existing structure along water main pipe to be abandoned or removed that does not conflict with proposed utility, sewer, bridge or roadway items may be abandoned per this specification. After the optional removal of all pipe, valves, fittings, taps and other water main elements, the brick or concrete structure must be filled in conformance with Section 605 of the IDOT Standard Specifications for Road and Bridge Construction and City of Chicago Department of Water Management Standards.

Filling. No work shall proceed prior to the shutdown of any water main passing through or adjacent to the vault structure to be removed. This work will consist of removing the frame and cover of an existing vault structure, removal of valves, fittings, taps and other elements of the water system, partial removal of the structure to a minimum depth of 36 inches below proposed grade and filling the structure with either sand or controlled low strength material (CLSM). The Contractor may elect to avoid salvaging any elements of the vault structure. If this occurs, the existing elements of the structure must be removed to a minimum depth of 36 inches below proposed grade and then filled in as described. Sand must be compacted. CLSM must meet the requirements of Section 593 of the IDOT Standard Specifications for Road and Bridge Construction.

Any frames, lids, valves, fittings, taps or other water main elements that are salvaged in reasonable condition in the opinion of the Engineer may be offered to the City of Chicago Department of Water Management. Any debris, including the frame, lid, valves, fittings, taps or other items must be disposed of off-site in an approved manner. The Contractor will pay for all disposal fees.

Method of Measurement. This work will be paid for per each vault filled using methods as described. No separate measurement for materials used for the purposes of filling structures will be made.

Basis of Payment. This work will be paid for at the contract unit price per each for FILLING VALVE VAULTS which price will be payment in full for all labor and materials necessary to complete the work as described. Salvaging of any materials will be considered incidental to this item.

## **FIRE HYDRANTS TO BE REMOVED**

Description. Work under this item will include the removal of existing City of Chicago Fire Hydrants as part of the complete removal of water main pipe leading to the fire hydrant to be removed. The removal of the fire hydrant must meet the requirements of Section 564 of the IDOT Standard Specifications for Road and Bridge Construction and City of Chicago Department of Water Management Standards.

Demolition. No work shall proceed prior to the shutdown of any water main leading to or adjacent to the fire hydrant to be removed. This work will consist of the removal of the City of Chicago fire hydrant in conformance with Section 564 of the IDOT Standard Specifications for Road and Bridge Construction and City of Chicago Department of Water Management Standards.

The fire hydrant must be removed using methods that minimize damage to the hydrant, pipe valves, fittings and other elements. After removal, the hydrant must be provided to the City of Chicago Department of Water Management (CDWM). If the hydrant is rejected by CDWM due to condition the hydrant must be disposed of off-site in an approved manner. The Contractor will pay for all disposal fees.

Method of Measurement. This work will be paid for per each fire hydrant removed as described.

Basis of Payment. This work will be paid for at the contract unit price per each for FIRE HYDRANTS TO BE REMOVED which price will be payment in full for all labor and materials necessary to complete the work as described. Salvaging of any materials will be considered incidental to this item.

## **WATER MAIN REMOVAL**

Description. This work will consist of the removal of water main of various sizes and all bends, fittings and all other appurtenances.

Water main shall be removed according to Article 561 of the "Standard Specifications" and in conformance with the methods identified in Article 551.03 of the "Standard Specifications"

Method of Measurement. This work shall be measured for payment according to Article 561.04 of the "Standard Specifications".

Any reducer pipe sections will be measured as the pipe size of the larger opening.

Water main within a vault structure to be removed will be considered a part of the vault structure unless the vault is easily removed around the pipe and the pipe can be removed as part of the removal of adjacent pipe.



Excavation in rock will be measured for payment according to Article 502.12.

Trench backfill for water main removal will be measured for payment according to Article 208.03, except an addition will be made for one-half of the volume of the pipe removed.

Basis of Payment. This work will be paid for at the contract unit price per foot for WATER MAIN REMOVAL, of the diameter specified. TRENCH BACKFILL will be paid for separately.

Excavation in rock will be paid for according to Article 502.13.

Trench backfill will be paid for according to Article 208.04.

Removal and replacement of unsuitable material below plan bedding grade will be paid for according to Article 109.04.

### **CONCRETE REMOVAL (SPECIAL)**

Description. This work will consist of furnishing all labor, equipment and materials for the removal of unreinforced concrete, reinforced concrete, masonry materials and other items utilized as thrust blocks for water main pipe that is to be removed. The work shall be done in accordance with the applicable portions of Section 501 of the Standard Specifications.

The water main that is to be removed utilizes thrust blocks, saddles, collars and other objects made of unreinforced and reinforced concrete, masonry materials and other similar items. Record information for the water main to be removed is included in the Plans for reference. Locations where concrete removal is expected to be necessary are identified on the Plans. Additional locations requiring concrete removal may be encountered and will be paid for as CONCRETE REMOVAL (SPECIAL). The Engineer shall determine if removal is required based upon the proposed structure or utility improvements. The removal required may only need to be partial due to minor conflict with the proposed improvement. Sheet piling, shoring and other forms utilized during the original installation of water main thrust blocks must also be removed and will not be measured or paid for separately.

The thrust block, saddle, collar or other item to be removed may be located adjacent to utility or sewer structures, pipes, ducts and other elements. The thrust block, saddle, collar or other item may be located deep within the ground. In all cases, the Contractor shall provide all necessary shoring and bracing in order to remove the structure.

All concrete, reinforcing steel, piling, masonry or other materials removed under this Item shall become the property of the Contractor and shall be disposed of by the Contractor off the site and in a lawful manner meeting all IDOT Policies and Procedures.

Method of Measurement. The existing thrust blocks, saddles, collars or other elements adjacent to or attached to water main for removal shall be measured in place. All work to be paid for as CONCRETE REMOVAL (SPECIAL) shall be agreed upon with the Engineer and be measured in place prior to the start of removal by the Contractor. The Contractor can be authorized to begin CONCRETE REMOVAL (SPECIAL) by the Engineer and the final measurements may take place after the removal of the thrust block, saddle, collar or other item at the location of removal prior to disposal.

Trench backfill utilized as backfill for the areas vacated by the concrete that was removed will be measured for payment according to Article 208.03.

Basis of Payment. This work will be paid for at the contract unit price per cubic yard for COCRETE REMOVAL (SPECIAL) at the volume measured. TRENCH BACKFILL will be paid for according to Article 208.04.

Removal and replacement of unsuitable material below plan bedding grade will be paid for according to Article 109.04.

## **TELEVISION INSPECTION OF SEWER**

Description. This work will consist of televising the storm sewer and combined sewer systems before and after construction as specified in the contract drawings.

Requirements. The Contractor must furnish a videotape of a televised inspection of the interior of all existing storm and combined sewers which may be impacted during construction under this contract. Record the videotape under the supervision of the Engineer. Perform two 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 before construction. 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. 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 Engineer, 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 Engineer 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 sewer televising per foot for the videotaping of the sewer before construction and prior to placement of the final wearing surface.

Basis of Payment. This work will be paid for at the contract unit price per foot for the TELEVISION INSPECTION OF SEWER.

The cleaning of sewers prior to videotaping before construction shall be paid for as STORM SEWERS TO BE CLEANED OR COMBINED SEWERS TO BE CLEANED.

### **CLEANING EXISTING DRAINAGE STRUCTURES AND SEWERS**

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

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

All other existing storm sewers, combined sewers, and drainage structures which are specified to be cleaned on the Plans will be cleaned according to Article 602.15.

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

### **COMBINED SEWER (EXTRA STRENGTH VITRIFIED CLAY PIPE) (CDOT) STORM SEWERS, EXTRA STRENGTH VITRIFIED CLAY PIPE (CDOT)**

Description. Work under these items shall be performed according to Section 550 of the IDOT Standard Specifications and the current City of Chicago Department of Water Management (DWM) Regulations for Sewer Construction and Stormwater Management and DWM Standard Specifications for Water and Sewer Main Construction, except as herein modified.

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

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

Construction Requirements. Where a 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 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.

QC/QA Requirements.

The Contractor must provide a Manufacturer's written certification that the materials comply with these specifications. All sewers and sewer structures must be inspected prior to the final payment to the Contractor.

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

Basis of Payment. This work will be paid for at the contract unit price per foot for the COMBINED SEWER (EXTRA STRENGTH VITRIFIED CLAY PIPE) of the diameter specified of the type, diameter, and material specified (CDOT) or STORM SEWERS, of the specified type, diameter, and material specified (CDOT).

Trench backfill will be paid for according to Article 208.04.

## **COMBINED SEWERS (CDWM)**

Description: This work shall consist of constructing combined sewers of the class, type, and diameter specified, at the locations shown on the Plans or as directed by the Engineer. This work shall be performed in accordance with the applicable portions of Section 550 of the IDOT Standard Specifications for Road & Bridge Construction, the current City of Chicago Department of Water Management (DWM) Regulations for Sewer Construction and Stormwater Management and Sections 30 and 31 of the Standard Specifications for Water & Sewer Construction in Illinois, except as modified herein.

General Requirements: All combined sewers shall be constructed using reinforced concrete pipe, which shall conform to ASTM Designation C 76, Class II. Concrete pipe joints shall conform to ASTM C 361 or C 443 for flexible gasket material, as specified in Article 30-4.01 of the Standard Specifications for Water & Sewer Construction in Illinois.

Pipe laying, jointing, and testing for the combined sewers shall be performed in accordance with Section 31 of the Standard Specifications for Water & Sewer Construction in Illinois.

The Contractor must maintain flow at all times in the existing sewer during and after construction. The Contractor is responsible for pumping and bypassing sewer flow from the existing sewer. The Contractor must take all necessary precautions to ensure 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 repaired.

Trenches resulting from the installation of combined sewer shall be backfilled according to the applicable requirements of Article 550.07.

Method of Measurement: Combined sewers will be measured for payment in place in feet. When the sewer enters a manhole, the measurement will end at the inside wall of the manhole. Allowance will be made for the length of pipe necessary to permit the pipe to meet the sides of the manhole. No payment for combined sewer will be made through a manhole where the manhole is paid for as a separate item.

Basis of Payment: This work will be paid for at the contract unit price per foot for COMBINED SEWERS (CDWM), of the class, type, and diameter specified.

Gasketed joints and sewer testing will also be included in the unit cost of this item.

The cost of pumping and bypassing sewers to permit rehabilitation operations shall be included in the unit cost of this item.

Trench backfill will be paid for according to Article 208.04.

**COMBINED SEWER ADJACENT TO OR CROSSING WATER MAIN  
STORM SEWER ADJACENT TO OR CROSSING WATER MAIN**

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

Pipe materials shall meet the requirements of Sections 40 and 41-2.01 of the "Standard Specifications for Water and Sewer Main Construction in Illinois" and the current "City of Chicago DWM Standard Specifications for Water and Sewer Main Construction", except PVC pipe will not be allowed. Ductile-Iron pipe shall be required and shall meet the minimum requirements for Thickness Class 50.

Method of Measurement. Sewers installed adjacent to or crossing water main shall be paid for per foot for COMBINED SEWER (WATER MAIN REQUIREMENTS) CDOT, of the diameter specified or STORM SEWER (WATER MAIN REQUIREMENTS) of the diameter specified.

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

**PIPE DRAINS (SPECIAL)**

Description. This work shall be in accordance with the applicable portions of Section 601 of the Standard Specifications.

Ductile-Iron pipe shall be required and the material and installation requirements shall be according to the latest edition of the "Standard Specifications for Water and Sewer Main Construction in Illinois", "City of Chicago Department of Water Management (DWM) Regulations for Sewer Construction and Stormwater Management", "City of Chicago DWM Standard Specifications for Water and Sewer Main Construction."

Method of Measurement. This work will be measured for payment in place per PIPE DRAINS (SPECIAL) of diameter specified.

Basis of Payment. This work will be paid for at the contract unit price per foot for PIPE DRAINS of diameter specified (SPECIAL).

### **REINFORCED CONCRETE PIPE ELBOW (CDWM)**

Description. This work shall be in accordance with the applicable portions of Section 542 of the Standard Specifications. The pipe elbow shall be constructed of reinforced concrete according to Article 1042.06 at the locations as indicated on the Plans. The material and installation requirements shall be according to the latest edition of the "Standard Specifications for Water and Sewer Main Construction in Illinois", "City of Chicago Department of Water Management (DWM) Regulations for Sewer Construction and Stormwater Management", "City of Chicago DWM Standard Specifications for Water and Sewer Main Construction."

Method of Measurement. This work will be measured for EACH of the REINFORCED CONCRETE PIPE ELBOW (CDWM).

Basis of Payment. The cost for furnishing all labor, materials and equipment necessary for excavation and construction of the pipe elbow shall be paid at the contract unit price of EACH for REINFORCED CONCRETE PIPE ELBOW (CDWM) of the diameter specified.

### **PLUG EXISTING PIPE**

Description. This work shall consist of plugging the ends of existing storm and/or combined sewers to be abandoned with a mortared brick or concrete masonry bulkhead, 8" minimum thickness in conformance with Sections 1041 and 1042 of the Standard Specifications, at locations shown on the Plans.

Construction Requirements. Based on a review of available information it is believed that there are no existing active connections draining into the pipe to be abandoned. However, before the pipe is abandoned, the Contractor must field verify there are no existing active connections draining into the pipe to be abandoned. In the event there are existing active connections, the Contractor must either re-route the existing active connection or maintain the existing pipe so as not to block flow from the existing active connections at no additional cost.

After field verification that there are no existing active connections draining into the pipe to be abandoned, the Contractor must plug the pipe to the satisfaction of the Engineer.

Method of Measurement. This work will be measured for payment per cubic yard of concrete masonry bulkhead for PLUG EXISTING PIPE.

Basis of Payment. This work will be paid at the contract unit price per cubic yard for PLUG EXISTING PIPE which price shall include all materials, labor and equipment necessary to plug existing storm and/or combined sewers at locations shown in the Plans, as specified herein, and as directed by the Engineer.

## **MANHOLES (CITY OF CHICAGO)**

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 lids shall 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 manhole frame and closed lid shall be placed on all manholes located within the cross walk or as directed by the Engineer.

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 MANHOLES, of the type, diameter specified, type of frame and grate or type of frame and lid specified (CITY OF CHICAGO).

## **PRECAST TUMBLING BASIN (CDWM)**

Description. Work under these items 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 (DWM) Regulations for Sewer Construction and Stormwater Management, 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 lids shall be in accordance with the City of Chicago Department of Water Management Standard Specifications for Water and Sewer Main Construction.



- d. Precast pipe and pipes for tumbling basin shall conform to the ASTM C76, Reinforced Concrete Culvert, Storm Drain and Sewer Pipe, Table 5, Wall B or C.

General Requirements. An ADA compliant frame and closed lid shall be placed on all precast tumbling basin located within the cross walk or as directed by the Engineer.

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

Basis of Payment. This work will be paid for at the contract unit price of each for PRECAST TUMBLING BASIN (CDWM) which includes the cost of the grate or frame and lid.

### **INLETS (CITY OF CHICAGO)**

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. Inlets shall be constructed as per City of Chicago Department of Water Management Standard A.16 (Standard Inlet – 2' Dia.) as shown in the Plans.

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 inlets located within the cross walk or as directed by the Engineer.

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 INLETS, of the type specified, type of frame and grate or type of frame and lid specified (CITY OF CHICAGO).

## **CATCH BASINS (CITY OF CHICAGO)**

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 Engineer.

The City of Chicago Department of Water Management's (DOWM) Rain Blocker Restrictor Program shall be maintained with any roadway improvement. The restrictors shall be installed in all catch basins outside of the Central Business District. Restrictors must not be installed in catch basins in close proximity to viaduct areas, bus stops, or emergency entrances. The City of Chicago Department of Water Management (DOWM) must approve the non-installation or removal of any restrictor. The restrictors can be obtained from City of Chicago Department of Water Management Central District at 3901 S. Ashland Avenue. The Contractor should arrange for pick up by contacting 312-747-1177 (7am to 3pm, Monday to Friday). The furnishing and installing of a restrictor shall be included in the contract unit price for catch basins.

Requirements for restrictor installation are as follows:

- Arterial Streets: 3-inch Orifice Restrictor
- Bus Routes: 3-inch Orifice Restrictor
- Residential Streets: 3-inch Vortex Restrictor
- Alleys: 3-inch Orifice Restrictor in the last catch basin

When using an orifice restrictor, insert it into the half-trap. Upon tightening of the center nut on the face of the restrictor, the rubber O-rings will expand inside the half trap providing a water-tight seal. Pull on the restrictor to verify a tight fit is made.

When applying a vortex restrictor, insert it with the opening down. Upon tightening of the 2 bolts on the face of the restrictor, the rubber O-rings will provide a water-tight seal. Pull on the restrictor to verify a tight fit is made.

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, of the type, diameter specified, type of frame and grate or type of frame and lid specified (CITY OF CHICAGO).

### **CATCH BASINS, TYPE A, 4'-DIAMETER, WITH SPECIAL FRAME AND GRATE**

Description. Work under this item shall be performed according to Sections 602 and 604 of the Standard Specifications, except as herein modified.

Materials. Materials shall be according to the following:

(a) The frame and grate shall be equivalent to Neenah Foundry R-2553.

Basis of Payment. This work will be paid for at the contract unit price per each for CATCH BASINS, TYPE A, 4'-DIAMETER, WITH SPECIAL FRAME AND GRATE.

### **INLETS, TYPE A, WITH SPECIAL FRAME AND GRATE**

Description. Work under this item shall be performed according to Sections 602 and 604 of the Standard Specifications, except as herein modified.

Materials. Materials shall be according to the following:

(a) The frame and grate shall be equivalent to Neenah Foundry R-2553.

Basis of Payment. This work will be paid for at the contract unit price per each for INLETS, TYPE A, WITH SPECIAL FRAME AND GRATE.

## **TRENCH DRAIN**

Description. Work under these items shall be performed according to Section 601, Section 602, and Articles 1006.14 and 1006.15 of the IDOT Standard Specifications and the current City of Chicago Department of Water Management (DWM) Regulations for Sewer Construction and Stormwater Management and DWM Standard Specifications for Water and Sewer Main Construction, except as herein modified.

This work shall consist of installing trench drain and grates at locations detailed in the Plans or as directed by the Engineer.

Materials. All materials shall be inspected for soundness and damage due to handling, immediately before being installed. Any item not conforming to the requirements of this Section will be rejected and must be immediately removed from the site.

Trench drains must be furnished with end pieces, anchors, and all appurtenances required for installation of the drain, which are included in this item. Trench drains must be connected to the nearest proposed drainage structure with PIPE DRAINS 6" (SPECIAL).

Manufacturers:

1. Neenah Foundry R-4999
2. East Jordan Iron Works
3. Any equivalent product approved by the Engineer

Grates must meet ASTM A48 Class 35-B for heavy-duty use and be installed per manufacturer's recommendations or per the details provided in the Plans. Grates must be ADA compliant.

Construction Requirements. This work involves excavating areas and subsequent construction of a cast-in-place, formed structure, and placement of reinforcement, which will support grates of the type shown in the Plans. This insides of the excavated trench areas shall be constructed in accordance with details shown in the Plans and shall have smooth walls determined by the Engineer. All labor, equipment, and material required for this work is included in this price.

Method of Measurement. This work will be measured for payment as each TRENCH DRAIN installed.

Basis of Payment. This work will be paid for at the contract unit price of each TRENCH DRAIN, which price shall include all costs for excavation and disposal of unsuitable material, bolts, anchors, connectors, and grates.

PIPE DRAINS 6" (SPECIAL) will be paid for at the contract unit price per foot PIPE DRAINS 6" (SPECIAL).

## **DRAINAGE STRUCTURES TO BE RECONSTRUCTED (SPECIAL)**

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

This work shall consist of removing and disposing of the upper portions of existing manholes and catch basins including but not limited to frames and grates, frames and lids, cones, and flat slab tops and then placing a solid precast reinforced concrete flat slab top over the drainage structure. This precast reinforced concrete flat slab top shall not have a 24" manway.

Construction Requirements. The existing manhole or catch basin shall be removed to an elevation at least 6 inches below the bottom of the existing pavement or as directed by the Engineer. The manhole or catch basin shall be securely sealed with a solid precast reinforced concrete flat slab top as directed by the Engineer. The solid precast reinforced concrete flat slab top shall be constructed as per IDOT Standard 602601-02 except that a 24" manway shall not be provided. The solid precast reinforced concrete flat slab top shall not be placed below the top of the highest pipe. Backfilling of the drainage structures to the grades necessary for the placement of the temporary pavement shall be included in the price of this item. All backfilling shall be performed according to Section 602 of the Standard Specifications and to the satisfaction of the Engineer.

Submittals. The Contractor shall submit shop drawings for the solid precast reinforced concrete flat slab top to the Engineer for review.

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

Basis of Payment. This work will be paid for at the contract unit price per each for MANHOLES TO BE RECONSTRUCTED (SPECIAL) and CATCH BASINS TO BE RECONSTRUCTED (SPECIAL) which price shall include all labor, excavation, backfilling, materials, and equipment necessary to remove and dispose of the upper portions of existing structures including but not limited to frames and grates, frames and lids, cones, and flat slab tops and placing a solid precast reinforced concrete flat slab top over the drainage structure and backfilling of the structure.

## **TEMPORARY DRAINAGE SYSTEM NO. 1**

Description. This work shall consist of furnishing all formwork, material, equipment and labor to install a temporary drainage system for the Halsted Street Bridge during Stage II of Maintenance of Traffic as herein specified and as directed by the Engineer. The drainage system is to be installed to intercept the runoff from the newly constructed eastern half of the Halsted Street Bridge. The runoff from the bridge shall be intercepted in the formwork that will be installed for the construction of eastern half of the bridge deck. This formwork runs along the western edge of the newly constructed eastern half of the bridge deck. This design is to be performed by the Contractor.

The formwork (and drainage system) shall remain in place for drainage purposes until the Contractor constructs the Stage II western portion of the bridge deck. The Contractor is responsible for intercepting the bridge deck drainage during all stages of construction to ensure that water does not fall down onto the I-290 roadway below. The water collected in the formwork drains from the crest of the bridge to both the north and south ends of the bridge. The water collected in the formwork will connect to an 8" pipe. The 8" pipes run along the top of the temporary soil retention system and down the face of the temporary soil retention system. The Contractor shall be responsible for securing the pipe to the top and to the face of the temporary soil retention systems. At the bottom of the temporary soil retention system the Contractor shall be required to direct the flow from the pipe into to a sump pit or a sedimentation basin before it enters the drainage system along I-290 as per the Illinois Urban Manual. If the Contractor uses a sump pit and is pumping the water out of the pit, a filter bag shall be required at the end of the pump discharge hose to ensure that sediment does not enter the storm sewer systems along I-290.

Design. The temporary drainage system shall be designed by the Contractor. The formwork shall be designed to carry the additional load caused by the water and shall be waterproofed. The formwork must provide, at a minimum, 0.56 square feet of waterway opening to convey the flow and shall not be less than 9 inches in depth from the flow line to the top of the formwork.

Construction Requirements: The Contractor shall submit, for approval by the Engineer, details and calculations prepared and sealed by an Illinois Licensed Structural Engineer and an Illinois Professional Licensed Civil Engineer of the temporary drainage system he/she proposes to use, prior to ordering of material and implementation. Such approval shall in no way relieve the Contractor of responsibility for the safety of the structure or the I-290 Interstate below. Any damage to the Halsted Street Bridge, Interstate 290, the existing formwork, or the temporary soil retention systems caused by the installation of the temporary drainage system shall be repaired at the Contractor's own expense and to the satisfaction of the Engineer. Any modifications to existing formwork required to install the temporary drainage system shall be included in the price for TEMPORARY DRAINAGE SYSTEM NO. 1. All dewatering, pumping, formwork, labor, equipment and materials required for this work is included in the price for TEMPORARY DRAINAGE SYSTEM NO. 1.

Method of Measurement: This work shall be measured by the contract lump sum for TEMPORARY DRAINAGE SYSTEM NO. 1 as indicated on the Plans and specified herein.

Basis of Payment. This work will be paid for at the contract lump sum price for TEMPORARY DRAINAGE SYSTEM NO. 1.

## **TEMPORARY SHORING**

Description. This item shall consist of furnishing all material, equipment and labor to support the existing piercap during stage construction as shown on the Plans, as herein specified and as directed by the Engineer.

Construction Requirements: The Contractor shall submit details and calculations, prepared and sealed by an Illinois Licensed Structural Engineer, of the support system he/she proposes to use for approval of the Engineer prior to ordering of material and implementation. Such approval shall in no way relieve the Contractor of responsibility for the safety of the structure. The supports used shall be such that vertical adjustments may be made in order to maintain the existing deck profile.

Method of Measurement. Temporary Shoring will be measured for payment by each.

Basis of Payment: The work specified herein, as shown on the Plans and as directed by the Engineer, shall be paid for at the contract unit price each for TEMPORARY SHORING.

## **TEMPORARY SOIL RETENTION SYSTEM**

Description. This work shall consist of designing, furnishing, installing, adjusting for stage construction when required and subsequent removal of the temporary soil retention system according to the dimensions and details shown on the Plans and in the approved design submittal, subject to the construction restrictions listed herein and on the drawings.

General. The temporary soil retention system shall be designed by the Contractor to retain, at a minimum, the exposed surface area specified in the Plans or as directed by the Engineer.

The design calculations and details for the temporary soil retention system proposed by the Contractor shall be submitted to the Engineer for approval. The calculations shall be prepared and sealed by an Illinois Licensed Structural Engineer. This approval will not relieve the Contractor of responsibility for the safety of the excavation. Approval shall be contingent upon acceptance by all involved utilities and/or railroads.

The design shall consider the restrictions on the installation of all components of the temporary soil retention system. These installation restrictions are listed in the next section of this special provision and in the "CONSTRUCTION VIBRATION MONITORING" special provision.

Construction. The Contractor shall verify locations of all underground utilities before installing any of the soil retention system components or commencing any excavation. Any disturbance or damage to existing structures, utilities or other property, caused by the Contractor's operation, shall be repaired by the Contractor in a manner satisfactory to the Engineer at no additional cost to the Department.

The soil retention system must be installed without the use impact-type pile drivers. The location of the temporary soil retention system as shown on the drawings is in a highly sensitive populated area with the potential for damage to adjacent older structures. The proposed equipment and procedures used for installation of sheet piles or other underground support components must be submitted to the Engineer for approval prior to their use. It is anticipated that vibratory equipment may be utilized in performing the work, subject to requirements of other sections of this specification. Contractor shall also submit any documentation available regarding the operating noise levels and operating vibration characteristics of the equipment proposed, prior to approval of the Engineer.

The approval of the equipment and procedure by the Engineer does not guarantee the performance in the field of the equipment will be acceptable. If, in the judgment of the Engineer, the noise and/or vibration effects exceed those required by the local residents, then the Contractor must halt production and find a remedy suitable to the Engineer. Threshold values for vibration monitoring are included in the special provision "CONSTRUCTION VIBRATION MONITORING." The costs incurred finding suitable equipment and procedures shall be included in the cost of this item. No additional costs shall be paid for this effort.

The soil retention system shall be installed according to the Contractor's approved design, or as directed by the Engineer, prior to commencing any related excavation. If unable to install the temporary soil retention system as specified in the approved design, the Contractor shall have the adequacy of the design re-evaluated. Any reevaluation shall be submitted to the Engineer for approval prior to commencing the excavation adjacent to the area in question. The Contractor shall not excavate below the maximum excavation line shown in the approved design without the prior permission of the Engineer. The temporary soil retention system shall remain in place until the Engineer determines it is no longer required.

The temporary soil retention system shall be removed and disposed of by the Contractor when directed by the Engineer. When allowed by the Engineer, the Contractor may elect to cut off a portion of the temporary soil retention system leaving the remainder in place. The remaining temporary soil retention system shall be removed to a depth which will not interfere with the new construction, and as a minimum, to a depth of 12 in. below the finished grade, or as directed by the Engineer. Removed system components shall become the property of the Contractor.

When an obstruction is encountered, the Contractor shall notify the Engineer and upon concurrence of the Engineer, the Contractor shall begin working to break up, push aside, or remove the obstruction. An obstruction shall be defined as any object (such as but not limited to, boulders, logs, old foundations etc.) where its presence was not obvious or specifically noted on the Plans prior to bidding, that cannot be driven or installed through or around, with normal driving or installation procedures, but requires additional excavation or other procedures to remove or miss the obstruction.

Portions of the existing roadway barriers must be removed in order to install the temporary soil retention system as shown on the drawings. This work shall be included in this pay item, and the barrier treated as an obstruction. The approval of the Engineer is required for the limits and method of removal, so that the barrier to remain can continue to function as intended.



Method of Measurement. The temporary soil retention system furnished and installed according to the Contractor's approved design or as directed by the Engineer will be measured for payment in square feet. The area measured shall be the vertical exposed surface area envelope of the excavation supported by temporary soil retention system. Portions of the temporary soil retention system left in place for reuse in later stages of construction shall only be measured for payment once.

Any temporary soil retention system installed beyond those dimensions shown on the contract Plans or the approved Contractor's design without the written permission of the Engineer, shall not be measured for payment but shall be done at the Contractor's own expense.

Basis of Payment. This work will be paid for at the contract unit price per square foot (square meter) for TEMPORARY SOIL RETENTION SYSTEM.

Payment for any excavation, related solely to the installation and removal of the temporary soil retention system and/or its components, shall not be paid for separately but shall be included in the unit bid price for TEMPORARY SOIL RETENTION SYSTEM. Other excavation, performed in conjunction with this work, will not be included in this item but shall be paid for as specified elsewhere in this contract.

Obstruction mitigation for other than the known tunnel obstruction shall be paid for according to Article 109.04 of the Standard Specifications.

## **TEMPORARY SOIL RETENTION SYSTEM, SPECIAL**

Description. This work shall consist of designing, furnishing, installation and subsequent removal of a temporary soil retention system required to protect the existing 48 inch water main structure east of the proposed abutment according to the dimensions and details shown on the Plans and in the approved design submittal, subject to the construction restrictions listed herein and on the drawings.

General. The Temporary Soil Retention System, Special shall be designed by the Contractor to retain all the loads that will bear on the proposed system including, but not limited to, soil pressure, hydrostatic pressure, construction surcharge and forces caused by anticipated thrust from the water main operation. These loads shall be applied to the exposed surface area specified in the Plans or as directed by the Engineer.

The design calculations and details prepared by the Contractor for the Temporary Soil Retention System, Special shall be submitted to the Engineer for approval. The calculations shall be prepared and sealed by an Illinois Licensed Structural Engineer. This approval will not relieve the Contractor of responsibility for the safety of the excavation. Approval shall be contingent upon acceptance by the involved utility agencies.

The design shall consider important restrictions on the installation of components of the temporary soil retention system. These installation restrictions are listed in the next section of this special provision and in the "CONSTRUCTION VIBRATION MONITORING" special provision.

Construction. The Contractor shall verify locations of all underground utilities before installing any of the soil retention system components or commencing any excavation. Any disturbance or damage to existing structures, utilities or other property, caused by the Contractor's operation, shall be repaired by the Contractor in a manner satisfactory to the Engineer at no additional cost to the Department. Utility information shown on the drawings was collected from available information at the time of the design, but must be considered an approximate location.

The soil retention system must be installed without the use impact-type pile drivers. The work is located in a highly sensitive populated area with the potential for vibration damage to adjacent older structures and subject to noise level limitations. The proposed equipment and procedures used for installation of soldier piles or sheet piles or other underground support components must be submitted to the Engineer for approval prior to their use. It is anticipated that vibratory equipment may be utilized in performing the work, subject to requirements of other sections of the Special Provisions. Contractor shall also submit any documentation available regarding the operating noise levels and operating vibration characteristics of the equipment proposed, prior to approval of the Engineer.

The approval of the equipment and procedure by the Engineer does not guarantee the performance in the field of the equipment will be acceptable. If, in the judgment of the Engineer, the noise and/or vibration effects exceed those required by the local residents, then the Contractor must halt production and find a remedy suitable to the Engineer. Threshold values for vibration monitoring are included in the special provision "CONSTRUCTION VIBRATION MONITORING." The costs incurred finding suitable equipment and procedures shall be included in the cost of this item. No additional costs shall be paid for this effort.

The soil retention system shall be installed according to the Contractor's approved design, or as directed by the Engineer, prior to commencing any related excavation. If unable to install the temporary soil retention system as specified in the approved design, the Contractor shall have the adequacy of the design re-evaluated. Any reevaluation shall be submitted to the Engineer for approval prior to commencing the excavation adjacent to the area in question. The Contractor shall not excavate below the maximum excavation line shown in the approved design without the prior permission of the Engineer. The temporary soil retention system shall remain in place until the Engineer determines it is no longer required.

The temporary soil retention system shall be removed and disposed of by the Contractor when directed by the Engineer. When allowed, the Contractor may elect to cut off a portion of the temporary soil retention system leaving the remainder in place. The remaining temporary soil retention system shall be removed to a depth which will not interfere with the new construction, and as a minimum, to a depth of 12 in. (300 mm) below the finished grade, or as directed by the Engineer. Removed system components shall become the property of the Contractor.

When an obstruction is encountered, the Contractor shall notify the Engineer and upon concurrence of the Engineer, the Contractor shall begin working to break up, push aside, or remove the obstruction. An obstruction shall be defined as any object (such as but not limited to, boulders, logs, old foundations etc.) where its presence was not obvious or specifically noted on the Plans prior to bidding, that cannot be driven or installed through or around, with normal driving or installation procedures, but requires additional excavation or other procedures to remove or miss the obstruction.

The Temporary Soil Retention System, Special is in close proximity to a 48 inch diameter Water main. The centerline of the water main is approximately eight feet below existing ground. This main is also subject to thrust forces resisted by 54 inch diameter caissons. Each of the four caissons near the work area for this item was designed to resist a radial thrust force of 70,000 lbs. The Contractor should account for the radial forces from the water main as required in the design of TEMPORARY SOIL RETENTION SYSTEM, SPECIAL. Existing drawings be furnished to the Contractor at his request. The dimensions, sizes and loads were taken from existing drawings and are not guaranteed to be accurate or, in the case of the loads, adequate.

Method of Measurement. The temporary soil retention system furnished and installed according to the Contractor's approved design or as directed by the Engineer will be measured for payment in square feet. The area measured shall be the vertical exposed surface area envelope of the excavation supported by temporary soil retention system. Portions of the temporary soil retention system left in place for reuse in later stages of construction shall only be measured for payment once.

Any temporary soil retention system installed beyond those dimensions shown on the contract Plans or the approved Contractor's design without the written permission of the Engineer, shall not be measured for payment but shall be done at the Contractor's own expense.

Basis of Payment. This work will be paid for at the contract unit price per square foot (square meter) for TEMPORARY SOIL RETENTION SYSTEM, SPECIAL.

Payment for any excavation, related solely to the installation and removal of the temporary soil retention system and/or its components, shall not be paid for separately but shall be included in the unit bid price for TEMPORARY SOIL RETENTION SYSTEM, SPECIAL. Other excavation, performed in conjunction with this work, will not be included in this item but shall be paid for as specified elsewhere in this contract.

Obstruction mitigation shall be paid for according to Article 109.04 of the Standard Specifications.

## **SOIL RETENTION SYSTEM**

Description. This work shall consist of designing, furnishing, installing and adjusting for stage construction where required the soil retention system according to the dimensions and details as shown on the Plans and in the approved design submittal. The system shall remain in place at the end of the contract.

General Requirements. The soil retention system shall be designed by the Contractor to retain the exposed surface area and all expected surcharge loads thereon as specified in the Plans or as directed by the Engineer.

The design calculations and details for the soil retention system proposed by the Contractor shall be submitted to the Engineer for approval. The calculations shall be prepared and sealed by an Illinois Licensed Structural Engineer. This approval will not relieve the Contractor of responsibility for the safety of the excavation. Approval shall be contingent upon acceptance by all involved utilities and/or railroads.

Construction. The Contractor shall verify locations of all underground utilities before installing any of the soil retention system components or commencing any excavation. Any disturbance or damage to existing structures, utilities or other property, caused by the Contractor's operation, shall be repaired by the Contractor in a manner satisfactory to the Engineer at no additional cost to the Department. The soil retention system shall be installed according to the Contractor's approved design, or as directed by the Engineer, prior to commencing any related excavation. If unable to install the soil retention system as specified in the approved design, the Contractor shall have the adequacy of the design re-evaluated. Any reevaluation shall be submitted to the Engineer for approval prior to commencing the excavation adjacent to the area in question. The Contractor shall not excavate below the maximum excavation line shown in the approved design without the prior permission of the Engineer. Once installed by the Contractor and approved by the Engineer, the soil retention system shall remain in place and not be removed.

When an obstruction is encountered, the Contractor shall notify the Engineer and upon concurrence of the Engineer, the Contractor shall begin working to break up, push aside, or remove the obstruction. An obstruction shall be defined as any object (such as but not limited to, boulders, logs, old foundations etc.) where its presence was not obvious or specifically noted on the Plans prior to bidding, that cannot be driven or installed through or around, with normal driving or installation procedures, but requires additional excavation or other procedures to remove or miss the obstruction.

Method of Measurement. The soil retention system furnished and installed according to the Contractor's approved design or as directed by the Engineer will be measured for payment in place, in square feet. The area measured shall be the vertical exposed surface area envelope of the excavation supported by soil retention system.

Any soil retention system installed beyond those dimensions shown on the contract Plans or the approved Contractor's design without the written permission of the Engineer shall not be measured for payment but shall be done at the Contractor's own expense.

Basis of Payment. This item will be paid for at the contract unit price per square foot for SOIL RETENTION SYSTEM.

Payment for any excavation, related solely to the installation of the soil retention system and/or its components, shall not be paid for separately but shall be included in the unit bid price for SOIL RETENTION SYSTEM. Other excavation, performed in conjunction with this work will not be included in this item but shall be paid for as specified elsewhere in this contract.

Obstruction mitigation shall be paid for according to Article 109.04 of the Standard Specifications.

## **STRUCTURAL STEEL (CTA)**

Description. This item consists of providing all labor and materials required for construction of the structural steel components of the canopy including columns, beams, roof framing. This item also includes the galvanizing and finish painting of the structural steel.

All materials and work must comply with the CTA Master Specifications.

Materials and Installation. The materials and installation of the canopy plumbing shall be as described in CTA MASTER SPECIFICATION SECTION 05 10 30 – STRUCTURAL STEEL, SECTION 05 50 00 METAL FABRICATIONS and 09 96 00 HIGH PERFORMANCE COATINGS.

Method of Measurement. This item of work will be measured on a lump sum basis for furnishing and installing STRUCTURAL STEEL (CTA).

Basis of Payment. This work will be paid for at the contract lump sum price for STRUCTURAL STEEL (CTA) which will be payment in full for labor and materials for installation. Galvanizing and finish painting of the structural steel are included in the cost of STRUCTURAL STEEL (CTA).

## **TRANSLUCENT CANOPY ROOF (CTA)**

Description. This item consists of providing all labor and materials required for construction of the canopy roof including framed assemblies with structured polycarbonate panels and manufacturer's standard sheet metal flashings and closures and joint sealers as shown on the Plans and detailed in the specifications.

All materials and work must comply with the CTA Master Specifications.

Materials and Installation. The materials and installation of the canopy roof shall be as described in CTA MASTER SPECIFICATION SECTION 08 90 00 – TRANSLUCENT CANOPY ROOF and 07 90 00 – JOINT SEALERS.

Method of Measurement. TRANSLUCENT CANOPY ROOF (CTA) will be measured for payment in square feet for the roof surface area.

Basis of Payment. This work will be paid for at the contract unit price per square foot for TRANSLUCENT CANOPY ROOF (CTA) which will be payment in full for labor and materials for installation of the canopy roof as noted above and as required by the CTA specifications.

### **FLASHING, GUTTERS AND SHEET METAL (CTA)**

Description. This item consists of providing all labor and materials required for construction of the metal gutters flashings and downspouts from the upper canopy to the lower canopy roof and installation of the fall restraint equipment on the canopy roof.

All materials and work must comply with the CTA Master Specifications.

Materials and Installation. The materials and installation of the flashing and gutters and fall restraint equipment shall be as described in CTA MASTER SPECIFICATION SECTION 07 60 00 – FLASHING AND SHEET METAL, 07 90 00 – JOINT SEALERS and SECTION 11 24 24 - FALL RESTRAINT EQUIPMENT.

Method of Measurement. This item of work will be measured on a lump sum basis for furnishing and installing FLASHING, GUTTERS and SHEET METAL (CTA).

Basis of Payment. This work will be paid for at the contract lump sum price for FLASHING, GUTTERS and SHEET METAL (CTA) which will be payment in full for labor and materials for installation flashing and gutters and fall restraint equipment as required by the CTA specifications.

### **PLUMBING - DOWNSPOUTS (CTA)**

Description. This item consists of providing all labor and materials required for construction of the pipe and pipe fittings for canopy roof drainage from the lower canopy to the connection to the stormwater system below the bridge.

All materials and work must comply with the CTA Master Specifications.

Materials and Installation. The materials and installation of the canopy plumbing shall be as described in CTA MASTER SPECIFICATION SECTION 22 40 00 – PLUMBING.

Method of Measurement. This item of work will be measured on a lump sum basis for furnishing and installing PLUMBING - DOWNSPOUTS (CTA).

Basis of Payment. This work will be paid for at the contract lump sum price for PLUMBING - DOWNSPOUTS (CTA) which will be payment in full for labor and materials for installation of the canopy plumbing as required by the CTA specifications.

## **CROSSHOLE SONIC LOGGING**

Description. This item shall consist of furnishing and installing test equipment access tubes in drilled shafts on the project, conducting Crosshole Sonic Logging (CSL) testing on drilled shafts to verify concrete quality, providing a report containing the test results and analysis, and subsequent grouting of the access tubes. The Engineer will determine which drilled shafts will have CSL testing and may expand the number of drilled shafts tested, beyond the number indicated in the summary of quantities.

The CSL test shall follow ASTM 6760 and measure the strength and time for an ultrasonic pulse to travel from a signal source in one access tube to a receiver in another access tube. In uniform, good quality concrete, the travel time between equidistant tubes should yield relatively consistent arrival times and corresponds to a reasonable pulse velocity, signal amplitude and energy from the bottom to the top of the shaft. Longer travel times, decrease in pulse velocity, and lower amplitude/energy signals indicate the presence of irregularities such as poor quality concrete, voids, honeycombing, cracking and soil intrusions.

Prequalification Requirements The CSL testing consultant shall have a minimum of two years of acceptable experience in CSL drilled shaft testing. No later than thirty (30) days prior to beginning drilled shaft construction, the Contractor shall submit to the Engineer for approval the following information:

- (a) Name, address, and phone number of the CSL testing consultant selected to perform the testing.
- (b) Names and experience of field staff conducting testing and engineer responsible for analyzing the results.
- (c) List of at least two (2) projects on which this consultant has successfully completed CSL testing. The list shall include a brief description of the project, the client or owner name and phone number, and number of shafts tested.

Submittals. No later than thirty (30) days prior to beginning drilled shaft construction, the Contractor shall submit to the Engineer for approval the following information:

- (a) Description of testing equipment and testing sequence on a typical shaft. Any modification or deviation to the testing procedures required by this special provision shall be so indicated.
- (b) The CSL tube size, materials compliance, end and top cap details, couplings, any coupling joints details, and the proposed method of attaching the tubes to the cage.
- (c) An example CSL report showing both sound and defective concrete.

Materials. The materials required for this item shall consist of the following:

- (a) The test equipment access tubes shall be either 1.5 inch (38 mm) or 2 inch (50 mm) inside diameter Schedule 80 or 40 steel pipe conforming to ASTM A53, Grade A or B, Type E, F, or S.
- (b) The grout used to fill the access tubes shall be a non-shrink 5000 psi (34.4 MPa) compressive strength grout according to Section 1024.

Equipment. The minimum requirements of the CSL testing equipment are as follows unless otherwise approved as part of the Contractor's submittal:

- (a) A microprocessor based CSL system for display of individual CSL records, analog-digital conversion and recording of CSL data, analysis of receiver responses and printing of report quality CSL logs
- (b) Ultrasonic source and receiver probes must be small enough to travel through 1.5 inch (38 mm) or 2 inch (50 mm) I.D. steel pipe access tubes and extend the full depth of the tube.
- (c) The probes shall be capable of producing records at a minimum frequency of 40,000Hz with good signal amplitude and energy in typical concrete.
- (d) An ultrasonic voltage pulser to excite the source with a synchronized triggering system to start the recording system.
- (e) A depth measurement device to electronically measure and record the source and receiver depths associated with each CSL signal.
- (f) Appropriate filter/amplification and cable systems for CSL testing.
- (g) An acquisition system that stores each log in digital format, with drilled shaft identification, date, time and test details, including the source and receiver gain. Arrival time data must be displayed graphically during data acquisition.
- (h) 3D tomographic imaging software, or source for completing the work

The equipment must be capable of providing the test results on thermal or graphical printouts with the vertical scale representing the vertical position along the shaft, and the horizontal scale representing the propagation time.



## CONSTRUCTION REQUIREMENTS

### Access tubes:

The Contractor shall place access tubes in all drilled shafts on the project unless otherwise indicated on the Plans or approved by the Engineer. The CSL Consultant must contact the drilled shaft Contractor and provide the technical instruction and guidance on obtaining and installing the access tubes so they will provide adequate bond to the concrete and yield the necessary data. The tubes must have a round, regular internal diameter, free of defects or obstructions to permit the free passage of the source and receiver probes. Four access tubes shall be installed in all drilled shafts with a diameter of 4.5 feet or less, five access tubes are required in shafts between 5 feet and 6 feet in diameter, six access tubes shall be used in 6.5 feet and 7.0 feet diameter shafts while eight tubes are required on larger shafts. Install the tubes in each drilled shaft in a regular, symmetric pattern such that each tube is equally spaced from the others around the perimeter of the cage. Tube placement must be such that large vertical reinforcing bars do not block the direct line between adjacent tubes. Securely attach the tubes to the interior of the reinforcement cage at vertical intervals not to exceed 3 feet (1 m) or otherwise secured such that the tubes remain in position during placement of the rebar cage and the concrete. The tubes must be vertical and parallel. Extend the tubes from 6 inches (150 mm) above the shaft tip to at least 3 feet (1 m) above the top of the shaft. If the shaft top elevation is below ground elevation, extend tubes at least 2 feet (610 mm) above ground surface. If the drilled shaft tip elevation is extended more than 1 foot (305 mm) below the tip elevation shown in the Plans, extend the tubes using proper threaded mechanical couplings to within 6 inches (150 mm) of the final tip elevation. Any joints used to construct the full tube length must be threaded mechanical couplings that produce a smooth interior surface, occur at the same elevation in each tube within the shaft and be watertight. Threaded water tight end caps shall be used at the bottom of each tube and a removable threaded end cap shall be provided on the top of the tubes. Do not use duct tape, other wrapping materials, or butt welding to seal joints. Under no circumstance will the tubes be allowed to rest on the bottom of the shaft excavation. Take care to not damage the tubes during the placement of reinforcing cage and the concrete. Before placement of the reinforcement cage into the shaft excavation, record the tube lengths and tube positions along the length of the cage. After placement of concrete, measure the stickup of the tubes above the top of the drilled shaft and verify tube spacing. After placement of the reinforcement cage and within 2 hours after concrete placement, fill the CSL tubes with clean, potable water, and cap them to keep out debris. The Engineer will reject tubes not filled and capped within 2 hours.

### CSL Testing Procedure:

The testing shall be conducted between 3 and 40 days after the drilled shaft has been placed and after concrete has attained 2/3 of the specified strength. The Contractor shall provide suitable access to the top of the shafts and any electricity, grout, water or other equipment support necessary to satisfy the CSL testing requirements. When removing the access tube caps, exercise care not to apply excess torque, force or stress, which could break the bond between the tubes and the concrete. The Contractor shall provide the CSL consultant with the as-constructed tube positions in each shaft including each tube length, top of tube elevation, top of shaft elevation, bottom of shaft elevation, and construction dates prior to beginning CSL testing.

Conduct CSL tests between each unique pairing of access tubes (i.e. 4 tubes have 6 different combinations, 5 have 10 combinations, 6 have 15, etc.). Perform the CSL testing with the source and receiver probes in the same horizontal plane unless test results indicate defects or poor concrete zones, in which case the defect zones must be further evaluated with angle tests (source and receiver vertically offset in the tubes). Report any defects indicated by decreased signal velocity and lower amplitude/energy signals to the Engineer at the time of testing, and conduct angle tests in the zones of the defects as defined by the Concrete Condition Rating Criteria (CCRC). Make CSL measurements at depth intervals of 3 inches (75 mm) or less from the bottom of the tubes to the top of each shaft. Pull the probes simultaneously, starting from the bottom of the tubes, using a depth-measuring device to electronically measure and record the depths associated with each CSL signal. The speed of ascent shall be less than 12 inches per second (300 mm/second). Remove any slack from the cables before pulling to provide for accurate depth measurements of the CSL records. In the event defects are detected, conduct additional logs, as needed, to fully identify the extent of the anomaly.

If steel tube debonding occurs, a 2 inch (50 mm) diameter hole shall be drilled to below the depth of debonding for each debonded tube in order to perform the CSL testing.

CSL Report:

The test results shall be submitted to the Engineer in the form of a report within 7 working days of completion of CSL testing. The CSL report should include but is not limited to the following:

- (a) Project identification
- (b) Dates of testing
- (c) Table and a plan view of each shaft tested with accurate identification of tube coordinates and tubes referenced to the site
- (d) Tube collar elevation
- (e) Names of personnel that performed the tests/interpretation and their affiliation
- (f) Equipment used
- (g) Data Logs, interpretation, analysis, and results.

(a)

The Data logs for each tube pair tested with analysis of the initial pulse arrival time, velocity, relative pulse energy/amplitude, and stacked waveform plotted versus depth. List all zones defined by the Concrete Condition Rating Criteria (CCRC) in a tabular format including the percent velocity reduction and the velocity values used from the nearby zone of good quality concrete. Discuss each zone defined by the CCRC in the CSL report as appropriate. Base the results on the percent reduction in velocity value from a nearby zone of good quality concrete with good signal amplitude and energy as correlated to the following:

(b) Concrete Condition Rating Criteria (CCRC)		
(c) CCRC (d) (Rating Symbol)	(e) Velocity Reduction	(f) Indicative Results
(g) Good (G)	(h) $\leq 10\%$	(i) Good quality concrete
(j) Questionable (Q)	(k) 10 % to < 20 %	(l) Minor concrete contamination or intrusion. Questionable quality concrete.
(m) Poor/Defect (P/D)	(n) $\geq 20\%$	(o) Defects exist, possible water/slurry contamination, soil intrusion, and/or poor quality concrete.
(p) Water (W)	(q) V = 4750 fps (r) (1450 mps) (s) to 5000 fps (t) (1525 mps)	(u) Water intrusion or water filled gravel intrusion with few or no fines present.
(v) No Signal (NS)	(w) No Signal Received	(x) Soil intrusion or other severe defect absorbed the signal (assumes good bond of the tube-concrete interface).

Do not grout the CSL tubes or perform any further work on the CSL tested drilled shaft until the Engineer determines whether the drilled shaft is acceptable. Perform tomography in order to further investigate and delineate the boundaries of any defective/unconsolidated zones with 20% or more reduction in velocity value as correlated to the CCRC. Process CSL data to construct easy to understand 2D/3D (2D cross-sections between tubes and 3D volumetric images for the entire shaft) color-coded tomographic images indicating velocity variations along the shaft. Location and geometry of defective/unconsolidated zones must be identified in 3D color images with detailed discussion in the CSL report.

**Correction of drilled shaft defect:**

When the field testing results or report determine that a defect is present, the Engineer will direct the Contractor to submit remedial measures for approval. No compensation will be made for remedial work or losses or damage due to remedial work of drilled shafts found defective or not in accordance with the drilled shaft special provision or the Plans. Modifications to the drilled shaft design or any load transfer mechanisms required by the remedial action must be designed, plans submitted sealed by an Illinois Licensed Structural Engineer, along with the design computations.

**Access tube grouting:**

After CSL test results have been reviewed and the Engineer has accepted the drilled shaft or approves grouting of the tubes, the tubes and any core holes shall be dewatered filled with a nonshrink grout according to Section 1024. Shafts with are not initially selected for CSL testing shall not be grouted until the results of the tested CSL test shafts have been reviewed and accepted.

**Method of Measurement:** This work will be measured per each shaft CSL tested. Access tubes installed and not utilized by the CSL testing equipment will not be included in the measurement of this item.

**Basis of Payment.** This work will be paid at the contract unit price per EACH for CROSSHOLE SONIC LOGGING. This payment will constitute full compensation for furnishing, installing, all access tubes, coring for debonded or clogged access tubes, equipment procurement, installation, testing, analysis, report, supplemental testing of grouting of access tubes, and drilled shaft repairs necessary.

## **HOT DIP GALVANIZING FOR STRUCTURAL STEEL**

**Description.** This work shall consist of surface preparation and hot dip galvanizing all structural steel specified on the Plans and painting of galvanized structural steel when specified on the Plans, except covered in the special provision for STRUCTURAL STEEL (CTA).

**Materials.** Fasteners shall be ASTM A 325 Type 1, High Strength bolts with matching nuts and washers.

**Fabrication Requirements.** To insure identification after galvanizing, piece marks shall be supplemented with metal tags for all items where fit-up requires matching specific pieces.

After fabrication (cutting, welding, drilling, etc.) is complete, all holes shall be deburred and all fins, scabs or other surface/edge anomalies shall be ground or repaired per AASHTO M 160. The items shall then be cleaned per Steel Structures Painting Council's Surface Preparation Specification SSPC-SP1 (Solvent Cleaning) and SSPC-SP6 (Commercial Blast Cleaning). All surfaces shall be inspected to verify no fins, scabs or other similar defects are present.

The Contractor shall consult with the galvanizer to insure proper removal of grease, paint and other deleterious materials prior to galvanizing.

### **Cleaning Structural Steel**

If rust, mill scale, dirt, oil, grease or other foreign substances have accumulated prior to galvanizing, steel surfaces shall be cleaned by a combination of either:

- Caustic cleaning and cleaning according to SSPC-SP8 (Pickling) or
- Cleaning according to SSPC-SP1 (Solvent Cleaning) and SSPC-SP6 (Commercial Blast Cleaning).

Special attention shall be given to the cleaning of corners and reentrant angles.

### **Surface Preparation and Hot Dip Galvanizing**

General. Surfaces of the structural steel specified on the Plans shall be prepared and hot dip galvanized as described herein.

Surface Preparation. A flux shall be applied to all steel surfaces to be galvanized. Any surfaces which will receive field-installed stud shear connectors shall not be galvanized within 2 in. (50 mm) of the stud location. Either the entire area receiving studs or just individual stud locations may be left ungalvanized. The following steel surfaces of bearings shall not be galvanized: stainless steel surfaces, surfaces which will be machined (except for fixed bearing sole plates), and surfaces which will have TFE, elastomer, or stainless steel parts bonded to them.

The cleaned surfaces shall be galvanized within 24 hours after cleaning, unless otherwise authorized by the Engineer.

Application of Hot Dip Galvanized Coating. Steel members, fabrications and assemblies shall be galvanized by the hot dip process in the shop according to AASHTO M 111.

Bolts, nuts, washers and steel components shall be galvanized in the shop according to ASTM F 2329.

All steel shall be safeguarded against embrittlement according to ASTM A 143. Water quenching or chromate conversion coating shall not be used on any steel work that is to be painted. All galvanized steel work shall be handled in such a manner as to avoid any mechanical damage and to minimize distortion.

Beams and girders shall be handled, stored and transported with their webs vertical and with proper cushioning to prevent damage to the member and coating. Members shall be supported during galvanizing to prevent permanent distortion.

Hot Dip Galvanized Coating Requirements. Coating weight, surface finish, appearance and adhesion shall conform to requirements of ASTM A 385, ASTM F2329, AASHTO M 111 or AASHTO M 232, as appropriate.

Any high spots of zinc coating, such as metal drip lines and rough edges, left by the galvanizing operation in areas that are to be field connected or in areas that are to be painted shall be removed by cleaning per SSPC-SP2 (Hand Tool Cleaning) or SSPC-SP3 (Power Tool Cleaning). The zinc shall be removed until it is level with the surrounding area, leaving at least the minimum required zinc thickness.

Shop assemblies producing field splices shall provide 1/8 in. (3 mm) minimum gaps between ends of members to be galvanized. At field splices of beams or girders, galvanizing exceeding 0.08 in. (2 mm) on the cross-sectional (end) face shall be partially removed until it is 0.04 in. to 0.08 in. (1 to 2 mm) thick.

Testing of Hot Dip Galvanized Coating. Inspection and testing of hot dip galvanized coatings shall follow the guidelines provided in the American Galvanizers Association publication "*Inspection of Products Hot Dip Galvanized After Fabrication*". Sampling, inspection, rejection and retesting for conformance with requirements shall be according to AASHTO M 111 or AASHTO M 232, as applicable. Coating thickness shall be measured according to AASHTO M 111, for magnetic thickness gage measurement or AASHTO M 232, as applicable.

All steel shall be visually inspected for finish and appearance.

Bolts, nuts, washers, and steel components shall be packaged according to ASTM F 2329. Identity of bolts, nuts and washers shall be maintained for lot-testing after galvanizing according to Article 505.04(f)(2) for high strength steel bolts.

A notarized certificate of compliance with the requirements listed herein shall be furnished. The certificate shall include a detailed description of the material processed and a statement that the processes used met or exceeded the requirements for successful painting of the surface, where applicable. The certificate shall be signed by the galvanizer.

Repair of Hot Dip Galvanized Coating. Surfaces with inadequate zinc thickness shall be repaired in the shop according to ASTM A 780 and AASHTO M 111.

Surfaces of galvanized steel that are damaged after the galvanizing operation shall be repaired according to ASTM A 780 whenever damage exceeds 3/16 in. (5 mm) in width and/or 4 in. (100 mm) in length. Damage that occurs in the shop shall be repaired in the shop. Damage that occurs during transport or in the field shall be repaired in the field.

After galvanizing, contact surfaces for any bolted connections shall be roughened by hand wire brushing or according to SSPC-SP7 (Brush-Off Blast Cleaning). Power wire brushing is not allowed.

All bolt holes shall be reamed or drilled to their specified diameters after galvanizing. All bolts shall be installed after galvanizing.

### **Surface Preparation and Painting**

Surface Preparation. When galvanized steel surfaces are specified to be painted they shall be clean and free of oil, grease, and other foreign substances. Surface preparation necessary to provide adequate adhesion of the coating shall be performed according to ASTM D6386. Surface preparation shall include, but not be limited to the following:

- All galvanized steel surfaces that are to be painted shall be cleaned according to SSPC-SP1 (Solvent Cleaning). After cleaning, all chemicals shall be thoroughly rinsed from the surface with a suitable solvent. The steel shall be allowed to completely dry prior to coating application.
- All galvanized steel surfaces that are to be painted shall be checked for the presence of chromate conversion coating according to ASTM D 6386 Appendix X1. Surfaces where chromate conversion coating is found shall be cleaned according to the same appendix and blown down with clean, compressed air according to ASTM D 6386 Section 6.1.
- All galvanized steel surfaces that are to be painted shall be checked for the presence of wet storage stain. Surfaces where wet storage stain is found shall be cleaned, rinsed and completely dried according to ASTM D 6386 Section 6.2.
- Following galvanizing, thickness readings shall verify the acceptable thickness of the galvanizing according to AASHTO M111/ASTM A123.

Paint Requirements. The paint materials (epoxy intermediate coat and aliphatic urethane finish coat) shall meet the requirements of the Articles 1008.05(d) and (e) of the Standard Specification.

All paint materials for the shop and field shall be supplied by the same manufacturer, and samples of components submitted for approval by the Department, before use.

Paint storage, mixing, and application shall be according to Section 506 of the Standard Specifications and the paint manufacturer's written instructions and product data sheets. In the event of a conflict the Contractor shall advise the Engineer and comply with the Engineer's written resolution. Until a resolution is provided, the most restrictive conditions shall apply.

Shop Application of the Paint System. The areas to be painted shall receive one full coat of an epoxy intermediate coat and one full coat of an aliphatic urethane finish coat. The film thickness of each coat shall be according to Article 506.09(f)(2).

Construction Requirements. The contact surfaces of splice flange connections (mating flange faces and areas under splice bolt heads and nuts) shall be free of paint prior to assembly. If white rust is visible on the mating flange surfaces, the steel shall be prepared by hand wire brushing or brush-off blasting according to SSPC-SP7. Power wire brushing is not allowed.

After field erection, the following areas shall be prepared by cleaning according to SSPC-SP1 (Solvent Cleaning), tie- or wash-coated if applicable, and then painted or touched up with the paint specified for shop application (the intermediate coat and/or the finish coat):

- exposed unpainted areas at bolted connections
- areas where the shop paint has been damaged
- any other unpainted, exposed areas as directed by the Engineer.

Special Instructions. Painting Date/System Code. At the completion of the work, the Contractor shall stencil in contrasting color paint the date of painting the bridge and the paint type code from the Structure Information and Procedure Manual for the system used according to Article 506.10(i). The code designation for galvanizing is "V". If painting of the structural steel is not specified then the word "PAINTED" may be omitted, the month and year shall then correspond to the date the stencil is applied.

Basis of Payment. The cost of all surface preparation, galvanizing, painting and all other work described herein shall be considered as included in the unit price bid for the applicable pay items to be galvanized and painted, according to the Standard Specifications.

## **TEMPORARY BRIDGE**

Description. This work shall consist of furnishing all labor, tools, equipment, and materials required to design, furnish and install a temporary bridge to provide pedestrians access to the CTA UIC-Halsted Blue Line station at Halsted Street as shown in the Plans and as described herein. The work shall be done in accordance with the applicable portions of Section 513 of the Standard Specifications and the details in the Plans.

The temporary bridge shall be considered a system. The system shall be complete in all details and intended functions. The bridge system shall provide pedestrian and emergency access to the building entrances along the limits of the project during demolition and reconstruction of Halsted Street Bridge. The bridge shall allow for ingress and egress from the CTA station entrance and exit at all times except as herein noted. Stairs or ramps required for the temporary bridge shall meet all ADA and City of Chicago requirements. The costs for removing, relocating and reinstalling the bridge or portions thereof to allow for the various stages of construction of the Halsted Street Bridge are included with this item.

The temporary bridge is to be kept clean and free of debris at all times. The cost of snow removal and ice removal from the temporary bridge and salting of the bridge is included with this item. Snow and ice shall be removed immediately between the hours of 6:00 AM and 7:00 PM. Snow and ice that accumulates at other times shall be removed prior to 6:00 AM. De-icing salts shall be applied as required to keep the bridge ice-free. The cost of de-icing salts and snow removal equipment and labor is included with this item. Damage to the bridge or graffiti on the bridge shall be repaired or removed immediately and the cost is included with this item.

General Requirements. The temporary bridge shall be designed and integrated with the approved demolition and construction schedule and deck and sidewalk construction sequencing. Temporary bridge less than 10'-0" wide shall not be used unless approved by the Engineer. Upon completion of the work, the temporary bridge shall be removed and disposed of by the Contractor. The cost of the removal and disposal is included with this item. The temporary bridge shall include chain link fence, with proper screening, approved by the Engineer. The temporary bridge shall be painted with a minimum of two coats of paint. The color shall be submitted to the Engineer for approval. The paint shall be a primer and topcoat compatible with each other and the substrate. Paint shall be applied in accordance with manufacturer's recommendations and shall be suitable for exterior applications.



The temporary bridge shall be designed in accordance with 2012 AASHTO LFRD Bridge Design Specifications 6th Edition, with 2013 Interim Revisions and 2009 AASHTO LFRD Guide Specifications for the Design of Pedestrian Bridges. The live load shall be 100 psf (full temporary bridge area) in lieu of the 90 psf specified in AASHTO Guide Specification. The longitudinal load shall be 10% of the live load and applied in accordance with AASHTO. The cost of obtaining the required geotechnical information for the design of the bridge and their corresponding foundations is included in this item. The bridge shall meet all ADA requirements with regard to longitudinal and transverse grades as well as skid resistance and all other applicable criteria (i.e. fire rating).

The temporary bridge shall be continuously open to pedestrian and emergency access at all times unless the closure is coordinated and approved by the Engineer and the CTA. Notice of thirty (30) calendar days must be provided to the CTA for Station closure. CTA will provide detour signs during the time of the station closures. Closures will include demolition of the existing bridge, erection of new girders, installation of shear connectors, forming of the deck, and concrete deck pour.

Lighting Requirements. The temporary bridge shall include lighting. Lighting units shall be a wall pack type to provide a minimum of 3 foot-candles of illumination on the temporary bridge. All wiring for the lights shall be in steel conduit. All such lighting and wiring shall be in accordance with the City of Chicago Electrical Code. The Contractor shall maintain the lighting system. Cost for labor and material to maintain and replace the lighting system and its components are included with this pay item. All damaged or burned out bulbs or fixtures shall be replaced immediately. All damaged wiring or connections shall be repaired immediately. The lighting system shall operate between dusk and dawn.

Submittals. The Contractor shall submit shop drawings of the proposed temporary bridge system to the Engineer for review. The shop drawings shall consist of the minimum information:

1. Layout of the temporary bridge including dimensions, elevations, and framing.
2. Foundation locations, loads, allowable foundation load information and designs.
3. Design calculations and details for the temporary bridge framing and connections along with material specifications.
4. Installation, removal and reinstallation methods and details.
5. Lighting details including fixtures and schematics.

Additional information may be requested to complete the review of the submittal by the Engineer. No additional compensation will be made for the additional requested information. The submittal and design calculations shall be sealed by an Illinois Licensed Structural Engineer and a licensed PE/AIA (for ADA requirements). The cost of preparing the submittals for approval is included with this item.

Method of Measurement. Temporary bridge shall be measured in lump sum. No additional payment will be made for the removal and re-installation of the temporary bridge in order to accommodate the Contractor's staging of construction operations. Payment for Temporary Bridge will be made after the final sidewalk is installed.

Basis of Payment. This work will be paid for at the lump sum price for TEMPORARY BRIDGE. The price shall be payment in full for all work, equipment, labor, and materials necessary for designing, furnishing, installing, removing, reinstalling, and disposing of the temporary bridge and including power and lighting and snow and ice removal and all other maintenance. The cost for stairs and ramps shall be included with the unit cost as measured above. No separate payments will be made for stairs and ramps.

## **CLASS SI CONCRETE MISCELLANEOUS**

Description. This work shall consist of providing equipment, materials and labor required to install a cast-in-place concrete fascia wall with concrete reveals at locations shown on the drawings and/or designated by the Engineer. It includes all reinforcing bars, waterproofing and drainage-related elements required for the construction of the complete wall as shown on the drawings

General Requirements. Contractor shall construct completely the fascia wall as shown on the drawings and in conformance with Standard Specifications.

### Construction Requirements.

Construction requirements for elements of the fascia wall complete shall conform to the following:

- a) Falsework.....Section 503.05
- b) Forms.....Section 503.06
- c) Placing and Consolidating.....Section 503.07
- d) Construction Joints.....Section 503.09
- e) Expansion Joints.....Section 503.10
- f) Drainage Openings.....Section 503.11
- g) Non-Metallic Water Seals.....Section 503.12
- h) Surface Finish.....Section 503.15
- i) Curing.....Section 503.17
- j) Waterproofing.....Section 503.18
- k) Protective Coat Application.....Section 503.19
- l) Reinforcing Bars .....Section 508

Fascia Wall shall be constructed in accordance with the requirements of Section 503-Concrete Structures.

After installation of the drilled shafts and after excavation has exposed the shafts to plan dimensions, inspect the shafts for quality of concrete and suitability of surface for installation of dowel bars. Patch all honeycombed or voided areas in order to provide sound surface for installation of dowel bars and drainage materials. Concrete repair materials and installation methods shall be submitted for approval to the Engineer. This work is considered included in this pay item.

Furnish and install reinforcing bars and dowel bars. Furnish and install drainage structures as shown on the drawings.

Contractor shall provide calculations and drawings for formwork support during installation and curing. The calculations shall be stamped by a licensed structural engineer. The formwork support system shall be reinforced against bulging and shall maintain the plumb and line of the wall as described in the contract documents.

Place expansion and/or control joints as described on the drawings and standard specifications. Horizontal construction joints are not allowed.

Formwork shall become the property of the contractor after use.

Materials. Materials shall be as designated in Section 503.02 of the Standard Specifications except as modified herein.

Concrete shall conform to Section 1020, and shall conform to Class SI concrete mix.

Furnishing and installing dowels into drilled shafts that support or reinforce the wall as shown on drawings is included in this pay item.

Drainage related items as shown on the drawings are included in this pay item, including drainage board, geocomposite wall drains, waterstops, vapor barrier and other separator sheets. Wall drainage-related items shall conform to Standard Specification 1040. Installation of geocomposite wall drain materials shall conform to Standard Specifications section 591, except that the drains shall be fastened to the caissons with wall nails or other suitable method as directed by the Engineer.

Method of Measurement. The work included in CLASS SI CONCRETE MISCELLANEOUS shall be measured in place and the volume computed in cubic yards of fascia wall from base of wall to the top of the poured wall. The width of the wall varies from point of tangency to caissons to maximum thickness between caissons as shown on the drawings. Concrete reveals will not be measured, but shall be considered included in the pay item. Additional concrete required due to out of alignment of the drilled shafts shall not be included in the measurement.

Dowel bars, reinforcing bars drainage board, geocomposite wall drains or any other appurtenances required for the completed wall will not be measured but shall be included in this pay item.

Basis of Payment. The work will be paid for at the contract unit price per furnished and installed CUBIC YARD of concrete for CLASS SI CONCRETE MISCELLANEOUS.

## **FORM LINER TEXTURED SURFACE**

The form liner textured surfaces shall conform to applicable portions of Section 503 of the Standard Specifications except as herein modified.

Description: This Work consists of designing, developing, furnishing and installing a form liner textured surface and forming concrete using reusable, high strength urethane and elastomeric form liners to achieve concrete treatment as shown on the Plans. Form liner textured surface shall be of the type specified at locations shown on the Plans or directed by the Engineer, and in accordance with the details shown in the Plans. This work shall also include furnishing and installing reveal and bevel strips.

Materials: Form liners for bridge piers shall be of high quality, highly reusable and capable of withstanding anticipated concrete pour pressures without causing leakage or physical defects. Forms for smooth surfaces shall be plastic coated to provide a smooth surface free of any impression or pattern. Reveals for the retaining walls shall be made of rubber material capable of reproducing the same quality texture with extended use on flat and curved surface.

General: Liners shall be attached to each other with flush seams and seams filled necessary to eliminate visible evidence of seams in cast concrete. Liner butt joints shall be blended into the pattern so as to create no vertical joints or reveals. Concrete pours shall be continuous form liner pattern fields. Finished textures shall be continuous without visual disruption and properly aligned over adjacent and multiple liner panels. After each use, liners shall be cleaned and visually inspected. Damaged liner shall be replaced when continued use or repair would diminish the aesthetics of the Work. At the end of the work, master molds and form liners shall be turned to the Owner, delivered at location designated by the Owner, for future use on other contracts.

### Submittals:

Shop drawings of the form liner texture surface shall be provided for each area of textured concrete.

1. Individual form liner pattern descriptions, dimensions and sequencing of form liner sections, typical cross sections, joints, corners, joint locations, edge treatment and any other conditions.
2. Elevation views and layouts showing the full height and length of the structure with each form liner outlined.
3. Two 24"x 24" samples of each texture and two 24"x24" samples with all textures specified, adjacent to each other.
4. Mockup

Acceptable Rail Manufactures:

1. Custom Rock International, St Paul, MN (Jim Rogers)
2. Scott Systems, Denver, CO

3. American Formliners, Inc, Naperville, IL
4. Approved Equal.

Method of Measurement: This Work will be measured for payment, complete in place, per square feet for FORM LINER TEXTURED SURFACE.

Basis of Payment: This Work will be paid for at the Contract Unit Price per square feet for FORM LINER TEXTURED SURFACE which price includes furnishing and placing all material required, including all labor, equipment and incidentals necessary to complete the Work as herein specified.

### **DECORATIVE RAILING (PARAPET MOUNTED)**

The railing shall conform to Section 503 and 509 of the Standard Specifications except as herein modified.

Description. This Work consists of furnishing and installing Chicago Barrier aluminum railing system of the type specified at locations shown on the Plans or directed by the Engineer, and in accordance with the details shown in the Plans.

Materials. Aluminum alloys 6063-T6 and 6061-T6 can be used interchangeably at the option of the manufacturer, with the requirements that the minimum physical properties must be 2500 PSI yield, 30,000 PSI Ultimate yield, and 10% elongations.

Color: Clear anodized with minimum 1.0 mil thickness. Color samples are to be submitted to the Engineer for approval.

General. The rail sections must be factory pre-bent into curves to form radii rather than employing angular splices at the expansion joints. Any bending must be done prior to finishing to avoid distortion of the rail and/or damage to the finishing properties of the alloy.

#### Submittals.

1. Manufactures certification that aluminum rail and connections meet IDOT and CDOT specifications.
2. Shop drawings including wall and railing system.
3. Color sample of railing.
4. Mockup of railings.
5. Calculations signed and sealed by an Illinois Registered Professional Structural Engineer

Coordination: Coordinate with Chicago Wall concrete barrier manufacturer, fence manufacturer, electrical and traffic surveillance requirements to install conduit and junction boxes.

Complete shop drawings and calculations by an Illinois Registered Professional Structural Engineer, and field installation drawings must be submitted to the Engineer for approval prior to ordering materials, commencement of any shop fabrication, and/or finishing.

Aluminum Railing. The aluminum rail system must be in accordance with the Plans and with AASHTO-AGC-ARTBE Joint Committee Task Force 13 Report "A Guide to Standardized Highway Barrier Hardware." This system must meet and match the color, shape, and composition of the Aluminum Railing as furnished and installed for the North Lake Shore Drive Project. Alternate systems that meet all requirements and specifications will be considered by the Engineer if submitted for approval at the time of the Pre-Bid Conference.

There will be a single source responsibility for the aluminum rail system, which will include but not be limited to the aluminum railing, the aluminum supports (stanchion system), anodizing, splices, color, thief protection system, structural calculations, and the design of all components above the top horizontal plane of the concrete wall system, bolts, fasteners, welding, shop fabrication, field erection, anchoring system, and freight etc. Bolts, studs, and embedment required must also be by the Contractor.

Design Requirements. The design requirements must be as set forth in the AASHTO Task Force 13 Report ("A Guide to Standardized Highway Barrier Hardware")

The cross section must conform to an ellipse 4" x 7 7/8".

Exposed fasteners must be stainless steel. All bolts must be A307.

No field welding will be permitted.

Structural Requirements: The aluminum railing system must conform to the requirements of AASHTO "Standard Specifications for Highway Bridges" Section 2.7.

All thickness and material specifications requirements, unless otherwise approved by the Engineer, must be based on certifications based on structural calculations provided by the Contractor.

Acceptable Rail Manufactures:

1. Valentine & Company, Middletown, OH.
2. Approved Equal.

Method of Measurement. This Work will be measured for payment, complete in place, per foot.

Basis of Payment. This Work will be paid for at the Contract Unit Price per foot for DECORATIVE RAILING (PARAPET MOUNTED), which price includes furnishing and placing all material required, including all labor, equipment and incidentals necessary to complete the Work as herein specified.

## **BRIDGE FENCE RAILING (SPECIAL)**

The fence railing shall conform to Section 503, 509 and 664 of the Standard Specifications except as herein modified.

Description. This Work consists of furnishing and installing decorative fence system of the type specified at locations shown on the Plans or directed by the Engineer, and in accordance with the details shown in the Plans.

Materials. T316 stainless steel.

Finish. Wire mesh frame, supports, attachment tabs, fence posts and exposed base plates shall have matt, non-directional surface, EN 10088-2 2K, maximum surface roughness of 05. Microns Ra., Wire mesh shall have surface finished as supplied by approved manufacturer.

Pickled and passivated process shall be used to remove all discoloration after fabrication for the entire fence rail system, including but not limited to mesh panels, posts, mounting tabs and anchor plate, per ASTM A380 and ASTM A967.

General. Mesh panels shall be framed with angle iron frames, mechanically attached to posts with angle iron mounting tabs. Wire mesh shall be welded to the backside of the angle iron frames with exposed welds. Frame supports shall be welded to back side of angle iron frame. Mounting tabs shall have slotted holes that mate with mounting holes on the mesh panel and shall be welded to posts.

Fence post carrying the mesh panels shall be normal to the parapet. The top and bottom of the mesh frame shall be parallel to grade line and top of bridge parapet.

### Submittals.

1. Manufactures' certification that stainless steel fence and connections meet IDOT and CDOT specifications.
2. Shop drawings including bridge parapet wall with the Chicago Pattern, railing and fencing system.
3. Samples of manufacturer's available surface finishes.
4. Sample of fence components, including mesh, 6" long sections of angle iron frame, posts and full size mounting tab. Samples to have the specified finish.
5. Manufactures' certificate of achieving the specified surface finish.
6. Mockup of mesh panel and post tested for required loads, and delivered on the site for appearance approval.
7. Calculations signed and sealed by an Illinois Registered Professional Structural Engineer.

Coordination: Coordinate with Chicago Wall concrete barrier manufacturer, rail manufacturer, electrical and traffic surveillance requirements to install conduit and junction boxes.

Complete shop drawings and calculations by an Illinois Registered Professional Structural Engineer, and field installation drawings must be submitted to the Engineer for approval prior to ordering materials, commencement of any shop fabrication, and/or finishing.

Stainless Steel Bridge Fence. The stainless steel system must be in accordance with the Plans and with AASHTO-AGC-ARTBE Joint Committee Task Force 13 Report "A Guide to Standardized Highway Barrier Hardware."

There will be a single source responsibility for the stainless steel mesh panel, which will include but not be limited to the stainless steel mesh, frame, intermediate support, finishing the product, structural calculations, bolts, fasteners, welding, shop fabrication, field erection, and freight etc. The rest of the system, including but not limited to attachment of the mesh panel to posts, bolts, studs, and required embedment must be responsibility of by the Contractor.

Design Requirements: The design requirements must be as set forth in the AASHTO Task Force 13 Report ("A Guide to Standardized Highway Barrier Hardware").

All fasteners and bolts must be stainless steel.

Structural Requirements: The bridge fence system must conform to the requirements of AASHTO "Standard Specifications for Highway Bridges" Section 2.7.

All thickness and material specifications requirements, unless otherwise approved by the Engineer, must be based on certifications based on structural calculations provided by the Contractor.

Stainless Steel Wire Mesh. Large scale, three wire, rigid cable. Percent open shall be minimum 62%. Maximum sphere diameter opening: 1 3/4". Min wire diameter shall be 0.162. Triple wire groups shall run horizontally.

Acceptable wire mesh panel manufacturer:

1. Banker Wire
2. Cambridge Architectural
3. GKD Metal Fabrics
4. Approved Equal.



Acceptable wire mesh product:

1. Banker Wire Architectural Mesh Pattern: M13Z-7
2. Approved Equal

Acceptable wire mesh product:

1. Banker Wire Architectural Mesh Pattern: M13Z-7
2. Approved Equal

Method of Measurement. This Work will be measured for payment, complete in place, per foot measured along the top of the fence railing.

Basis of Payment. This Work will be paid for at the Contract Unit Price per foot for BRIDGE FENCE RAILING (SPECIAL), which price includes furnishing and placing all material required, including all labor, equipment and incidentals necessary to complete the Work as herein specified.

## **PILE EXTRACTION**

Description. This item shall consist of furnishing all labor, equipment and materials necessary for the extraction of timber piles at locations shown on the Plans, or as directed by the Engineer, including all pertinent work such as removal and satisfactory disposal of adjacent concrete mats or other obstructions interfering with the removal operations as directed by the Engineer. The work shall be done in accordance with the applicable portions of Section 501 of the Standard Specifications.

The work shall conform in every respect to all environmental, state and local regulations regarding construction requirements, the protection of adjacent properties, as well as dust and noise control.

Prior to commencing work under this Item, the Contractor shall verify the location of all existing utilities in the area. The Contractor shall submit drawings and written documentation to the Engineer of such verification. All work under this Item shall be executed in such a manner so as not to disturb or damage the existing utilities.

The work shall consist of removing all obstructions interfering with the pile extraction in the vicinity of the proposed drilled shafts as shown on the Plans. Excavation by hand may be required to expose the top of timber piles which interfere with the proposed drilled shafts construction. The Contractor shall extract the piles in a way so that the piles will not break. All excavation required for satisfactory completion of this work shall be considered incidental to this item.

The Contractor shall obtain all approvals and permits required for all operations as may be required for the removal of the existing timber piles.

All materials removed under this Item shall become the property of the Contractor and shall be disposed of by the Contractor off the site and in a lawful manner meeting all IDOT Policies and Procedures.

Construction Requirements. The Contractor shall submit drawings, complete with a list of equipment and methods the Contractor proposes to use for the removal and disposal of all existing timber pile to the Engineer for review. Further, the Contractor shall submit copies of all approvals and permits for the work under this Item to the Engineer. All work under this Item shall be performed so as not to disturb adjacent facilities or construction. The removal shall include all timber piles and related materials encountered at each existing timber pile. If an existing timber pile breaks during removal operations, the Contractor is required to remove the remaining remnants of the existing timber pile prior to installation of any Drilled Shaft.

Method of Measurement. Removal of existing pile shall be measured for payment by the number (each) of the complete pile. No other or separate measurement will be made for this Item.

Basis of Payment. The work under this Item will be paid for at the Contract unit price each for PILE EXTRACTION, as indicated on the Plans and as specified herein.

## **REMOVAL OF EXISTING STRUCTURES NO. 1**

Description. This item shall consist of furnishing all labor, equipment and materials necessary for the removal and disposal of the existing Harrison Street Bridge over Southbound I-90/94 and Ramp ES. The work shall be done in accordance with the applicable portions of Section 501 of the Standard Specifications.

Structure elements of the Harrison Street Bridge over Southbound I-90/94 and Ramp ES including, but not limited to, abutments, abutment footings, approach slabs, piers, pier footings, beams, bearings, diaphragms, deck, sidewalk railing and fence, piles (to a depth of 1 foot below excavation limit unless shown otherwise on the drawings) shall be included in Removal of Existing Structures, No. 1.

Included in the Removal of Existing Structures, No. 1 shall be partial removal of the east abutment, to limits noted on the Plans. Contractor is cautioned that the east abutment counterforts and stem are to remain, to the limits shown on the drawings. Also included is complete removal of existing piers and west abutment, all to a minimum of one foot below the excavation limit as shown on the Plans.

Included in the Removal of Existing Structures, No. 1 shall be the complete or partial removal (to a minimum depth of 1 foot from proposed structure) of any abandoned structure elements that may interfere with the construction with the new bridge.

Included in the Removal of Existing Structures, No. 1 shall be the removal of items and appurtenances located on, attached or adjacent to the bridge including, but not limited to, bicycle racks, fence and fence railing, light pole support structures, newspaper stands, signs and highway sign structures attached to the fascia of the bridge, and slopewalls.

The Contractor shall remove all embedded City of Chicago conduits and hand or manholes. Conduits attached to the existing structure using supports and hangers are anticipated to be removed by others prior to the beginning of work under this item. The City of Chicago has identified that records are unclear if asbestos concrete is present in the existing conduits. The City of Chicago will remove cables and wire in advance of the conduit removal or will confirm that the cables and wire are not live and can be removed by the Contractor.

Contractor shall coordinate with utilities to remove and/or relocate existing utilities within the work zone prior to structure removal activities. Where utilities were identified during design they are shown on the drawings. The final location of utilities is the responsibility of the Contractor and is included in Removal of Existing Structures, No. 1.

The existing bridge is adjacent to the Cermak Pumping Station. All removal activities must be performed while protecting Pumping Station property. Additionally there are several utilities identified in the Plans that the Contractor shall protect while performing removal activities. Any damage to Pump Station property must be restored to the satisfaction of the Engineer at the Contractor's expense.

The work shall conform in every respect to all environmental, state and local regulations regarding construction requirements, the protection of adjacent properties, as well as dust and noise control.

Prior to commencing work under this Item, the Contractor shall verify the location of all existing utilities in the area. The Contractor shall submit drawings and written documentation to the Engineer of such verification. All work under this Item shall be executed in such a manner so as not to disturb or damage the existing utilities.

All materials removed under this Item shall become the property of the Contractor and shall be disposed of by the Contractor off the site and in a lawful manner meeting all IDOT Policies and Procedures.

Included the Removal of Existing Structures No. 1, prior to any removal of conduit material, the existing conduits must be tested for the presence of asbestos content by qualified personal and/or qualified testing firm. Tests shall be comprehensive, and include detail visual inspection, sampling as determined by qualified testing firm or personnel and laboratory testing for samples in order to determine if conduits included asbestos cement. Each of the existing conduits should be independently reviewed due to unknown installation or maintenance improvement records. All testing records and results shall be provided to the Engineer prior to any removal of existing City of Chicago conduits. If test identify that the conduits do contain asbestos, the removal of those conduits shall follow the specification for REMOVAL OF ASBESTOS CEMENT CONDUIT. Otherwise, the conduits shall be removed under the requirements of this section.

#### Traffic Operations

The traffic using Interstate I-90/94 must remain open to all lanes of traffic during demolition activities unless the Contractor has secured the necessary permits from the Illinois Department of Transportation to allow for temporary closure of lanes.

Method of Measurement. Removal of Existing Structures, No. 1 shall be measured for payment by each of the structure removed including additional elements noted above.

Basis of Payment. The work under this Item will be paid for at the Contract unit price each for REMOVAL OF EXISTING STRUCTURES, NO. 1, as indicated on the Plans and as specified herein.

## **REMOVAL OF EXISTING STRUCTURES NO. 2**

Description. This item shall consist of furnishing all labor, equipment and materials necessary for the removal and disposal of the existing Halsted Street Bridge (S.N. 016-2081) over Interstate 290 and CTA. The work shall be done in accordance with the applicable portions of Section 501 of the Standard Specifications.

All structure elements of the Halsted Street Bridge over I-290 including, but not limited to, abutments, abutments' footings, piers, piers' footing, wingwalls, beams, bearings, diaphragms, deck, sidewalk railing and fence, piles (to a depth of 1 foot below proposed structures or as noted on the Plans or directed by the Engineer) shall be included in Removal of Existing Structures No. 2.

Included in the Removal of Existing Structures No. 2 shall be the removal of items and appurtenances located on, attached or adjacent to the bridge including, but not limited to, bicycle racks, CTA appurtenances and newspaper stands and highway sign structures attached to the fascia of the bridge.

The Contractor shall remove all embedded City of Chicago conduits and hand or manholes. Conduits for other utilities attached to the existing structure using supports and hangers are anticipated to be removed by others prior to the beginning of work under this item for each section under the staged construction of the structure. The City of Chicago has identified that records are unclear if asbestos concrete is present in the existing conduits. The City of Chicago will remove cables and wire in advance of the conduit removal unless the City of Chicago determines that cables are not live and can be removed as part of the bridge demolition.

Included in the Removal of Existing Structures No. 2, the Contractor shall coordinate with ComEd, AT&T, City of Chicago Office of Emergency Management and Communications (OEMC 911) and City of Chicago Department of Electric Operations. The Contractor is required to coordinate the removal of ComEd, AT&T and City conduits. Existing conduits and wires owned by ComEd and AT&T will be removed by ComEd and AT&T. The removal of the bridge shall be staged and the limits of removal and schedule of removal shall be coordinated with ComEd, AT&T and the City of Chicago. AT&T will ultimately be removing service from the bridge and ComEd and the City of Chicago will be maintaining the existing or modified service that is presently attached to the existing bridge.

The existing bridge is adjacent to the existing entrance to the CTA Blue Line station and over the CTA rail lines. All demolition activity must protect CTA property. Any damage to CTA property must be restored to the satisfaction of the CTA at the Contractor's expense.

The close proximity of the work activities to active CTA rail tracks imposes additional safety requirements. All activities over or in CTA right-of-way must comply with all CTA requirements and CTA FLAGGING AND COORDINATION.

The work shall conform in every respect to all environmental, state and local regulations regarding construction requirements, the protection of adjacent properties, as well as dust and noise control.

Prior to commencing work under this Item, the Contractor shall verify the location of all existing utilities in the area. The Contractor shall submit drawings and written documentation to the Engineer of such verification. All work under this Item shall be executed in such a manner so as not to disturb or damage the existing utilities.

All materials removed under this Item shall become the property of the Contractor and shall be disposed of by the Contractor off the site and in a lawful manner meeting all IDOT Policies and Procedures.

Included in the Removal of Existing Structures No. 2, and prior to any removal of conduit material, the existing City of Chicago conduits must be tested for the presence of asbestos content by qualified personal and/or qualified testing firm. Tests shall be comprehensive, and include detail visual inspection, sampling as determined by qualified testing firm or personnel and laboratory testing for samples in order to determine if conduits included asbestos cement. Each of the existing conduits should be independently reviewed due to unknown installation or maintenance improvement records. All testing records and results shall be provided to the Engineer prior to any removal of existing City of Chicago conduits. Conduits that are determined to contain asbestos will be removed in accordance with REMOVAL OF ASBESTOS CEMENT CONDUIT. Otherwise, the conduits shall be removed under the requirements of this section and will not be paid for separately.

Due to the concrete encasements for all or portions of the existing conduits crossing the bridge, including AT&T, ComEd and the City of Chicago, the testing of existing conduits must take place during the partial removal of the bridge, after the deck of the one half of the bridge structure has been removed. The concrete encased ducts may be integrally attached to the deck structure. At that time, ComEd and AT&T will test the conduits and concrete encasement. If ComEd, AT&T or their subcontractors determine that there is asbestos within the concrete encased duct, then it will be the Contractor's responsibility to safely remove portions of the concrete encased duct bank for abatement by ComEd or AT&T. The removal of the concrete encased ductbank will not be paid for separately, and must follow all regulations for handling asbestos containing materials. The asbestos containing materials to be abated by ComEd or AT&T must be stockpiled on site in a safe and secure manner in accordance with all laws and regulations. The utilities will inventory and abate all concrete encased ComEd and AT&T ductbanks determined to contain asbestos. Requirements for the removal of existing ducts and concrete encased ducts shall follow the specification for REMOVAL OF ASBESTOS CEMENT CONDUIT.

After the completion of the east portion of the bridge and the shift of traffic to the new bridge, the west portion of the bridge will be demolished. The existing conduits, including those owned by AT&T will need to be removed. The Contractor shall coordinate the removal with AT&T.

Existing piles that are determined and noted in the Plans to be completely removed will be paid for separately as PILE EXTRACTION.

Traffic Operations

The traffic using Interstate I-290 must remain open to all lanes of traffic during demolition activities unless the Contractor has secured the necessary permits from the Illinois Department of Transportation to allow for temporary closure of lanes.

Rail Operations

The CTA rail traffic must remain operational at all times during demolition activities unless the Contractor has secured the necessary permits from CTA to allow for temporary halting of rail traffic.

Method of Measurement. Removal of Existing Structures no. 2 and testing for asbestos content shall be measured for payment by each of the structure removed including additional elements noted above.

Basis of Payment. The work under this Item will be paid for at the Contract unit price each for REMOVAL OF EXISTING STRUCTURES NO. 2, as indicated on the Plans and as specified herein.

## **CONSTRUCTION VIBRATION MONITORING**

Description. This work consists of monitoring buildings and other locations susceptible to movement. Additional monitoring of facilities may be required and these will be determined by the Engineer during the work. This additional monitoring is included in this item. The Contractor shall monitor adjacent buildings for both vibration and displacement. The Contractor shall designate a minimum of two monitoring point locations for each of the structures located at 400 South Green Street (Green Street Lofts), 815 West Van Buren Street (Rice Building), 333 South Halsted Street (National Hellenic Museum), 700 South Halsted Street (UIC Courtyard Residence Hall) and 735 West Harrison Street (Cermak Pumping Station). The monitoring point locations shall be spaced as evenly as possible along the building edge at the interface between the bridge and the building properties. The monitoring points for vibration and displacement do not have to be at the same location. The Contractor shall coordinate with the Engineer and building owners to ensure the proposed monitoring locations are acceptable to the building and accessible to both the Contractor and the Engineer. Proposed locations of building vibration and displacement monitoring points are to be submitted to the Engineer for approval prior to construction.

CTA Track Monitoring; The Contractor will include monitoring of the eastbound and westbound CTA tracks below and adjacent to a portion of construction in the contract. The Contractor will monitor CTA tracks for vertical and horizontal movements. As a minimum, monitor daily from start of demolition through completion of new bridge structure installation, then weekly through project completion. Submit copies of reports to CTA for review. The reports shall identify monitoring instrumentation utilized, measurement data, stop work periods, corrective measures and other associated information. Maximum allowable horizontal and vertical movements are  $\frac{1}{4}$  inch. If movements in excess of  $\frac{1}{4}$  inch are detected, the Contractor will discontinue construction operations immediately and notify the CTA. CTA will evaluate the track condition and determine what restorative work is required. The Contractor will perform this required work and the Contractor's expense prior to continuing remaining contract work. If track repairs are required, the Contractor shall hire a Contractor experienced in CTA track work and approved by the CTA to perform the corrective repairs to the satisfaction of the CTA.

Vibration Monitoring: The Contractor shall employ the services of a seismic monitoring consultant as approved by the Engineer. Monitoring point locations and frequency of data collection shall be as determined by the Contractor's Consultant and are subject to the approval of the Engineer. All vibration monitoring devices (seismographs) shall be attached to the floor of the buildings they are monitoring. The limit of acceptable vibration (Limiting Value) at structure shall be 0.5 in/s (inches per second) peak particle velocity. The Contractor's consultant may propose a Threshold Value of vibration for Engineer's review. When the Threshold Value is reached, the Contractor must stop the work and meet with the Engineer to determine the best course of action to reduce the vibrations (or minimize further displacement). Once the Limiting Value is reached, the work is stopped and a more formal response plan is submitted for approval before work can proceed. All seismographs on the project shall be programmed to actuate an alarm when the Threshold Value is exceeded. The alarm notification protocol shall consist of immediate dialing of mobile telephone numbers of the Engineer and the Contractor.

If the Limiting Value is exceeded, all vibration inducing work within 100 feet of the existing building shall be stopped. Work may resume at the direction of the Engineer with the Contractor continuing to closely monitor vibration in the area of the alarm. If the work is stopped because the Limiting Value is exceeded there will be no additional compensation nor any additional time extensions granted. Any change in construction methods to avoid exceeding Limiting Value will not be grounds for additional compensation.

Displacement Monitoring: The Contractor shall provide the exact horizontal and vertical location of the displacement monitoring points to the Engineer prior to the commencement of any construction activities. The data shall be presented in a tabular format and shall include horizontal positions (stations and offsets or Northing and Easting) as well as vertical elevation (Chicago City Datum) to a minimum of one hundredth of a foot (0.01').

Monitoring Frequency: During the beginning phase of each stage of demolition and construction, displacement monitoring shall be performed at the beginning and end of each work day at a minimum. These surveying intervals are the minimum required, and more frequent monitoring may be required by the Engineer as field conditions warrant.

If after a period of time resulting in movements that are small in magnitude, monitoring frequency can be reduced to a frequency as established by the Engineer. If resulting movements become random in nature and/or large in magnitude, the frequency shall be increased as directed by the Engineer. The frequency of readings will be dictated by the phase of current construction but must be sufficient to detect serious movements so that corrective measures can be initiated immediately.

Monitoring readings for displacement shall be dated, recorded, and reported to the Engineer the same day the readings are taken.

Vibration monitoring shall be a continuous and uninterrupted process. During demolition within 50 feet of a vibration monitoring point location, the Contractor shall report the results of the largest amplitude of vibration to the Engineer on the same day. At all other times the vibration report shall be submitted weekly.

Construction Requirements. Before the start of construction, the Contractor will complete a preconstruction inspection of 400 South Green Street (Green Street Lofts), 815 West Van Buren Street (Rice Building), 333 South Halsted Street (National Hellenic Museum), 700 South Halsted Street (UIC Courtyard Residence Hall) and 735 West Harrison Street (Cermak Pumping Station). Before the start of construction, the Contractor will complete a preconstruction inspection of the existing buildings listed above. Readily visible conditions and distress such as unusual cracks in concrete or masonry, obvious signs of leakage, settlement, etc. will be photographically recorded and documented. The Contractor will also make a DVD survey to provide a more complete general record of conditions in those areas. The interior survey shall include the first floor and basement (if existing) within 30 feet of the exterior wall closest to the project site. The exterior survey will include the exterior wall closest to the project site and the two adjacent walls. The survey will be performed from grade without the use of magnification devices. At the conclusion of the pre-construction field work, a report shall be prepared by the Contractor presenting the observed existing conditions and shall include written, videotaped and photographic documentation. This record shall then be used by the Contractor as a basis for comparison to distresses that may occur after the survey. The locations of the displacement monitoring points shall be included in the Report.

The Contractor will use the preconstruction report to aid in the selection of the displacement monitoring points. The Contractor must devise means and methods of construction that will not exceed the specified vibration limits. The Contractor is advised that particularly careful demolition requirements will be required at the edges of the bridge where the property line is immediately adjacent to the area of construction.

Corrective Measures. If at any time resulting movements are serious in nature or cause damage to facilities or property, the Contractor shall stop work immediately and the necessary corrective measures shall be initiated as directed by the Engineer. Damage as a result of the work activity of the Contractor will be corrected by the Contractor as determined by the Engineer. No additional compensation will be due the Contractor for repairing these facilities. The Contractor will not be entitled to any claim of delay for stopping of working to make correct measures.



Submittals. The Contractor must submit a Vibration and Displacement Control Plan to the Engineer for Approval. The Plan must be approved prior to the commencement of work. The plan must include, but is not limited to the following:

- Locations of all monitoring points (Vibration and displacement).
- Procedure and outline for how the data will be provided to the Engineer.
- Type of seismograph to be used (Submit to Engineer for Approval).
- List of pneumatic equipment to be used during demolition operations.
- Contact information for the Seismic Monitoring consultant.
- Timetable that outlines the duration that each monitoring point will be maintained and checked.

A "Response Plan" to detail how the Contractor will address any concerns with vibration or displacement.

Additional Submittals include:

- Daily reports of all displacement monitoring
- Weekly reports of all vibration monitoring

Method of Measurement. The work under this item as described herein will not be measured separately. It will be paid for as lump sum.

Basis of Payment. This work will be paid at the contract unit price per lump sum for CONSTRUCTION VIBRATION MONITORING which payment shall be full compensation for the work described herein and as directed by the Engineer.

## **REMOVAL OF ASBESTOS CEMENT CONDUIT**

Description: This work consists of the removal and disposal of friable asbestos cement electrical conduits owned by the City of Chicago. The conduits shall be demolished including conduit supports and hangers. All work shall be done in accordance with the requirements of the U.S. Environmental Protection Agency (USEPA), the Illinois Environmental Protection Agency (IEPA), the Occupational Safety and Health Administration (OSHA), and as outlined herein.

Under the Halsted Street Bridge structure, the City of Chicago has a 9 duct package, a 6 duct package and a 6 duct package that provides connections for their Office of Emergency Management and Communications (OEMC) and CDOT Department of Electrical Operations across I-290. There are active facilities in the ducts that will be temporarily rerouted during construction. Additional ducts are located within the existing hollow piers. Portions of the existing ducts are concrete encased. The ducts were installed as part of the original bridge construction, which occurred in two different stages in the 1950's.

Under the Harrison Street bridge structure, the City of Chicago has an 8 duct package that provides connections for their Office of Emergency Management and Communications across SB 190/94. There are active facilities in the ducts that will be temporarily rerouted during construction. The ducts provide connections into the Cermak Pumping Station. The ducts were installed as part of the bridge reconstruction, which occurred in the 1980's.

The City of Chicago has identified that records are unclear if asbestos concrete is present in the existing conduits, though the chance for asbestos in the ducts along Harrison Street remains low. Prior to any removal of any conduit material, the existing conduits must be tested for the presence of asbestos content by qualified personnel and/or qualified testing firm. Tests should be comprehensive, and include detailed visual inspection, sampling as determined by qualified testing firm or personnel and laboratory testing of samples in order to determine if conduits include asbestos cement. Each of the existing conduits should be independently reviewed due to unknown installation or maintenance improvement records. No separate payment for testing of the existing conduits will be made. The testing of existing conduits shall be included as part of REMOVAL OF EXISTING STRUCTURES NO. 1 or REMOVAL OF EXISTING STRUCTURES NO. 2. All testing records and results shall be provided to the Engineer prior to any removal of existing City of Chicago conduits.

If testing identifies that asbestos cement is not present in the existing conduits, the conduits shall be demolished as part of REMOVAL OF EXISTING STRUCTURES NO. 1 or REMOVAL OF EXISTING STRUCTURES NO. 2. If testing identifies that asbestos cement is present in the existing conduits, the removal of the conduits shall follow the procedures identified within this specification.

The work involved in the removal and disposal of friable or non-friable asbestos done prior to demolition of the Halsted Street Bridge structure or Harrison Street bridge structure shall be performed by a qualified Contractor or Sub-Contractor.

The Contractor shall provide a shipping manifest to the Engineer for the disposal of all asbestos containing material wastes.

The Contractor shall coordinate with the City of Chicago for the replacement of their ducts under this contract. The Contractor shall coordinate with ComEd and AT&T for the removal of their ducts by others. Existing ComEd and AT&T ducts parallel to the City of Chicago ducts may contain asbestos.

Permits: The Contractor shall apply for permit(s) in compliance with applicable regulations of the Illinois Environmental Protection Agency. Any and all other permits required by other federal, state, or local agencies for carrying on the work will be the responsibility of the Contractor. Copies of these permits must be sent to the district office and the Engineer.

Notifications: The "Demolition/Renovation Notice" form, which can be obtained from the IEPA office, shall be completed and submitted to the agencies listed below at least 10 days prior to commencement of any asbestos removal or demolition activity.

- A. Asbestos Demolition/Renovation Coordinator  
Illinois Environmental Protection Agency  
Division of Air Pollution Control  
P. O. Box 19276  
Springfield, Illinois 62794-9276  
(217)785-1743
- B. U. S. Environmental Protection Agency  
Air Compliance Branch  
77 W. Jackson Blvd.  
Chicago, Illinois 60604  
Attention: Asbestos Coordinator

Notices must be updated if there is a change in the starting date or the amount of asbestos changes by more than 20 percent

#### Submittals

- A. All submittals and notices shall be made to the Engineer except where otherwise specified herein.
- B. Submittals that shall be made prior to start of work:
1. Submittals required under Asbestos Abatement Experience.
  2. Submit documentation indicating that all employees have had medical examinations and instruction on the hazards of asbestos exposure, on use and fitting of respirators, on protective dress, on use of showers, on entry and exit from work areas, and on all aspects of work procedures and protective measures as specified in Worker Protection Procedures.
  3. Submit manufacturer's certification stating that vacuums, ventilation equipment, and other equipment required to contain airborne fibers conform to ANSI 29.2.
  4. Submit to the Engineer the brand name, manufacturer, and specification of all sealants or surfactants to be used. Testing under existing conditions will be required at the direction of the Engineer.
  5. Submit proof that all required permits, site locations, and arrangements for transport and disposal of asbestos-containing or asbestos-contaminated materials, supplies, and the like have been obtained (i.e., a letter of authorization to utilize designated landfill).
    - Information about vehicles and equipment utilized for transport of material designated for disposal shall be submitted. This should include methods for restricting loose fibers from being released during travel.

6. Submit a list of penalties, including liquidated damages, incurred through non-compliance with asbestos abatement project specifications.
7. Submit a project specific Health and Safety plan for the removal operations. The Health and Safety Plan must be approved and signed by sub-contractor and Contractor personnel, and shall be provided to the Engineer prior to commencing site work activities. The Contractor shall be and remain liable for compliance by its employees, agents and subcontractors with the Contractor's Health and Safety Plan and procedures for the site and shall hold Engineer and Department harmless from all claims, damages, suits, losses and expenses in any way arising from non-compliance with the Health and Safety Plan.
  - i. In particular, the Health and Safety Plan shall address personal protection from asbestos fiber releases during asbestos abatement.
8. Submit a detailed plan of the procedures proposed for use in complying with the requirements of this specification. Include in the plan the location and layout of decontamination units, the sequencing of work, the respiratory protection plan to be used during this work, a site safety plan, a disposal plan including the location of an approved disposal site, and a detailed description of the methods to be used to control pollution. The plan must be submitted to the Engineer prior to the start of work.
9. Submit proof of written notification and compliance with Paragraph "Notifications."

C. Submittals that shall be made upon completion of abatement work:

1. Submit copies of all waste chain-of-custodies, trip tickets, and disposal receipts for all asbestos waste materials removed from the work area;
2. Submit daily copies of work site entry logbooks with information on worker and visitor access;
3. Submit logs documenting filter changes on respirators. HEPA vacuums, negative pressure ventilation units, and other engineering controls; and
4. Submit results of any bulk material analysis and air sampling data collected during the course of the abatement including results of any on-site testing by any federal, state, or local agency.

Certificate of Insurance:

- A. The Contractor shall document general liability insurance for personal injury, occupational disease and sickness or death, and property damage.
- B. The Contractor shall document current Workmen's Compensation Insurance coverage.
- C. The Contractor shall supply insurance certificates as specified by the Department.

Asbestos Abatement Experience:

A. Company Experience:

1. Prior to start of work, the Contractor shall supply:
  - a. Evidence that he/she has been qualified with the State of Illinois and he/she has been included on the Illinois Department of Public Health's list of approved Contractors.

B. Personnel Experience:

1. For Superintendent, the Contractor shall supply:
  - a. Evidence of knowledge of applicable regulations in safety and environmental protection is required as well as training in asbestos abatement as evidenced by the successful completion of a training course in supervision of asbestos abatement as specified in 40 CFR 763, Subpart E, Appendix C, EPA Model Contractor Accreditation Plan. A copy of the certificate of successful completion must be provided to the Engineer prior to the start of work.
  - b. Documentation of experience with abatement work in a supervisory position as evidenced through supervising at least two asbestos abatement projects; provide names, contact, phone number, and locations of two projects in which the individual(s) has worked in a supervisory capacity.
  - c. The superintendent shall be thoroughly familiar with and experienced at asbestos abatement, characterization, bulking, transportation, and disposal activities and other related work, and shall be familiar with and shall enforce the use of all applicable safety procedures and equipment. The Supervisor shall be knowledgeable of, and enforce, all applicable, USEPA, IEPA, and OSHA requirements and guidelines.
2. For Workers involved in the Removal of Friable and Nonfriable Asbestos the Contractor shall provide:

- a. Training as evidenced by the participation and successful completion of an accredited training course for asbestos abatement workers as specified in 40 CFR 763, Subpart E, Appendix C, EPA Model Contractor Accreditation Plan. A copy of the certificate of successful completion must be provided to all employees who will be working on this project.
- b. Workers shall be familiar with and experienced at asbestos abatement, characterization, bulking, transportation, and disposal activities and other related work; and Asbestos Workers shall be familiar with the use of applicable safety procedures and equipment.

Abatement Air Monitoring:

The Contractor shall comply with the following:

A. Personal Monitoring:

1. All personal monitoring shall be conducted per specifications listed in OSHA regulation, Title 29, Code of Federal Regulation 1926.58. All area sampling shall be conducted in accordance with 40 CFR Part 763.90. All air monitoring equipment shall be calibrated and maintained in proper operating condition. Excursion limits will be monitored daily. Personal monitoring is the responsibility of the Contractor. Additional personal samples may be required by the Engineer at any time during the project.

B. Contained Work Areas for Removal of Friable Asbestos

1. Area samples shall be collected for the department within the work area daily. A minimum of one sample shall be taken outside of the abatement area removal operations. The Engineer will also have the option to require additional personal samples and/or clearance samples during this type of work.

C. Air Monitoring Professional

1. All air sampling will be conducted by a qualified Air Sampling Professional supplied by the Contractor. The Air Sampling Professional must submit documentation of successful completion of the National Institute for Occupational Safety and Health (NIOSH) course #582 – “Sampling and Evaluating Airborne Asbestos Dust”.
2. Air Sampling will be conducted in accordance with NIOSH Method 7400. The results of these tests will be provided to the Engineer within 24 hours of the collection of air samples.

Method of Measurement: This work will be measured for payment per foot for REMOVAL OF ASBESTOS CEMENT CONDUIT, as shown for each individual conduit, which price shall include furnishing all labor, materials, equipment and services required to remove and dispose of the friable asbestos cement conduits, hangers, and conduit supports. No separate payment will be made for any testing of existing conduits for the presence of asbestos cement prior to the removal of any conduit material. Removal of concrete encasement is to be included in REMOVAL OF EXISTING STRUCTURES NO. 1 and REMOVAL OF EXISTING STRUCTURES NO. 2.

Basis of Payment: This work will be paid for at the contract unit price per foot for REMOVAL OF ASBESTOS CEMENT CONDUIT.

### **LOCATE TUNNEL, CHICAGO**

Description. Work under this item shall consist of furnishing all labor, equipment, tools, excavation, backfill and items required to create and maintain the shaft excavations, all materials, and incidentals necessary to locate the existing water tunnel within the project limits. This work shall be performed in accordance with the applicable portions of Sections 501, 502, and 516 of the Standard Specifications, except as herein modified.

The Contractor shall field locate the tunnel within the limits specified on the Plans.

General Requirements. All work shall be performed as shown on the Plans and as directed by the Engineer. The procedures described herein are consistent with tunnel location procedures developed and utilized by the Chicago Department of Water Management (CDWM).

Construction Requirements. Procedure for Locating the Existing Water Tunnel:

1. The exact location of the tunnel is unknown and documentation of the tunnel location is restricted to designations on bridge and expressway record drawings.
2. At a minimum of four locations along the estimated alignment, accurately locate center of tunnel cross-section with probes. This is necessary as the exact location of the tunnel is not documented. If the alignment of the tunnel is not considered to be on a consistent and expected bearing, additional locations should be considered. The initial identified locations for the tunnel to be located are shown on the Plans.
3. The foundation drawing showing the tunnel location submitted for review must show the probe locations and the locations that "hit" the tunnel to confirm the Contractor has accurately located the tunnel.
4. Drill hole to top of tunnel with 12" drill and note exact elevation of top of tunnel. Install casing to maintain opening. A casing must be installed in all cases - no exceptions will be allowed.
5. Drill through top of tunnel; determine elevation of invert of tunnel. **Note if a substantial amount of water comes out of the hole notify the Engineer immediately.**
6. A video or sonar survey must be performed after the completion of the cased holes into the tunnel at each location. The survey must be done to:
  - a. Verify the location of the tunnel

- b. Verify the casings are located near the center of the tunnel so the bulkheads can be successfully installed (if a bulkhead is planned at that location).
  - c. Ensure the tunnel is clear between the existing or proposed bulkhead locations. If it is discovered that either of the casings are located to the side of the tunnel, a new casing must be installed nearer to the center of the tunnel to ensure a successful bulkhead installation, and the old casing abandoned by filling with concrete.
  - d. At the location immediately to the west of the existing bulkhead at Halsted Street, the existing bulkhead should be inspected to determine if there is a need to install a new bulkhead. The existing condition should identify if the integrity of the bulkhead will allow the tunnel to be filled without allowing CLSM material to migrate beyond the existing bulkhead.
  - e. At the location to the east of Halsted Street, the survey should establish an alignment of the existing tunnel in the immediate area and to identify if the existing tunnel is filled. If the tunnel is filled, the type of fill material and the extents of the fill material must be established.
7. The Contractor shall perform a survey showing the location of the tunnel and the bulkhead areas. The survey shall be provided to the Engineer.

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

Basis of Payment The cost of locating the tunnel will be paid for at the each price for LOCATE TUNNEL, CHICAGO. This includes all exploration, restoration, samples, surveys, video, sonar, drilling or any other means necessary to locate the tunnel within the designated area on the Plans.

## **BULKHEAD TUNNEL, CHICAGO**

Description. Work under this item shall consist of furnishing all labor, equipment, tools, excavation, backfill, items required to create and maintain the shaft excavations, all materials, and incidentals necessary to bulkhead the existing tunnel within the project limits. This work shall be performed in accordance with the applicable portions of Sections 501, 502, and 516 of the Standard Specifications, except as herein modified.

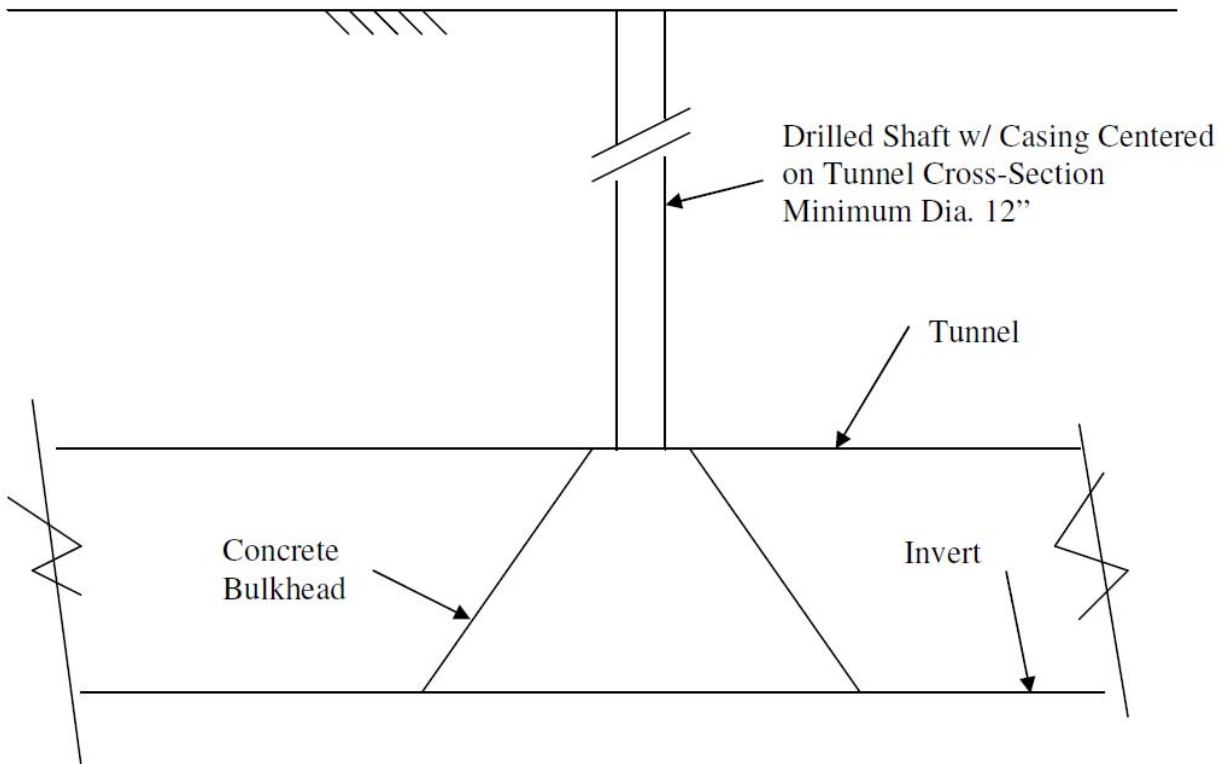
The Contractor shall construct a concrete bulkhead at the locations specified on the Plans and as detailed below.

General Requirements. All work shall be performed as shown on the Plans and as directed by the Engineer. The installation of the proposed bulkhead shall result in a safe and stable structure at all times, and shall comply with all safety requirements as required by all City, State, and Federal laws, codes or other regulations. The procedures described herein are consistent with tunnel bulkhead procedures developed and utilized by the Chicago Department of Water Management (CDWM).

Construction Requirements. Procedure for Establishing Bulkheads within the Existing Water Tunnel:



1. Calculate the amount of very low slump, lean concrete needed to form bulkhead in tunnel.
2. Determine if water is contained in tunnel.
3. Place concrete in tunnel to 1 ft above top of tunnel (use tremie methods if tunnel contains water). Actual amount of concrete placed must be compared to calculated amount to fill tunnel.
4. When concrete sets, drill a 4" core to the invert of tunnel. Verify from an examination of the cores that the bulkhead has no discontinuities.
5. If the bulkhead verification is satisfactory by the Engineer, complete filling the core hole with concrete to surface.
6. Keep core samples drilled for verification for inspection for a minimum of 4 weeks.
7. If the bulkhead cannot be confirmed, move to new location (6 to 8 ft away) and keep repeating procedure until tunnel bulkhead closure can be confirmed.
8. Provide drawings to the Engineer showing the location of bulkhead(s), amount of concrete placed, calculated amount of concrete required, and any problems encountered in establishing the bulkhead(s) in a letter to the Engineer within 1 week of completing the bulkhead(s).
9. After a bulkhead is established at each location as shown in the Plans, the tunnel between the bulkheads must be removed as part of excavation as part of temporary earth retention system installation and riser shaft construction. The tunnel must be removed where the existing tunnel conflicts with proposed improvements.
10. After completion of bulkhead installation, the Contractor shall restore any damaged parkway, pavement or sidewalk to its condition prior to the start of operations. All excess grout shall be removed and disposed of in accordance with the Standard Specifications.



**Figure No. 1**

Method of Measurement. BULKHEAD TUNNEL, CHICAGO will be measured for payment as each and will include all locations shown on the Plans.

Basis of Payment. The cost of bulkheading the tunnel will be paid for at the EACH unit price for BULKHEAD TUNNEL, CHICAGO, which price includes all drilling, removal and disposal of all material, construction of any retaining or support structures, repairs to existing concrete structures, concrete, core samples, backfill, and any incidentals required to complete the work as specified herein or as directed by the Engineer to bulkhead the tunnel to the satisfaction of the Engineer.

## **WATER MAIN RELOCATION 54" (CDWM)**

Description. This work under this item consists of installing ductile iron water main, fittings, hydrants, valves and other appurtenances for the relocation of the 54" water main relocation in west Harrison Street Halsted Street and along the west right-of-way of the southbound I-90/94. The work shall be performed as detailed on the Plans, specified herein and directed by the IDOT Resident Engineer and the Chicago Department of Water Management Commissioner or his representative (Engineer).

A portion of required ductile water main, fittings, valves and other appurtenances will be available to the Contractor as part of a separate contract, Contract 60X27. These items will be stored at an IDOT owned and operated facility after a delivery date no later than January 31, 2014. Provided the Contractor has established a secure work site, the Contractor may elect to receive the ductile water main, fittings, valves and other appurtenances directly from the delivery by the Contractor under Contract 60X27. Any discrepancies between the received items and expected materials, condition, sizes or other qualities for identified items must be communicated to the Engineer immediately. The items procured under 60X27 are identified in the Plans. Additional pipe, fittings, valves and other items shown on the Plans and as required to execute the work are included within this item and will not be paid for separately. All valve vaults, basins, inspection manholes and other structures shown on the Plans are included within this item and will not be paid for separately.

The Contractor is advised that the work will be performed on a potable water system owned and operated by the Chicago Department of Water Management (CDWM). As such, all operations shall be performed in such a way as to avoid contamination of the water system through the introduction of contaminants or the process of the work. All work will require the review and approval of the CDWM prior to the commencement of work operations.

The water main shutdown required to perform the Work will only be allowed between October 1<sup>st</sup> and May 1<sup>st</sup>. The Work must be substantially complete in order to place the water main back into service on or before May 1<sup>st</sup> 2014. The construction schedule must clearly indicate when testing of the new water main items will be made and for the water main to be inspected by CDWM. The construction schedule must clearly indicate when testing of the new water main items will be made and for the water main to be inspected by CDWM.

Construction Requirements. The furnishing and installation of ductile iron water main, fittings, hydrants, line valves and other appurtenances for the relocation of the 54" water main shall conform to the Contract and the applicable sections of the Chicago Department of Water Management's Technical Specifications for Water Main Construction shown below and included as part of this special provision (See Appendix B):

Ductile Iron Pipe and Fittings	Section 33 11 13
Water Main Control Valves	Section 33 12 16
Fire Hydrants	Section 33 12 19
Water Main Valve Basins & Meter Vaults	Section 33 12 20

Any part or item of work, which is implied and normally required to make the water main installation satisfactorily and completely operable, is deemed to be included in the Work Item and Contract price, including excavation, bedding, trench backfill and other items related to the installation of the water main pipe and structures. All miscellaneous appurtenances and/or items of Work considered incidental to meeting the intent of the Contract Documents is also deemed to be included in the Work Item and Contract price, even though such appurtenances may not be specifically shown or specified. All required testing of the installed or partially installed water main is included in this item and will not be paid for separately. Testing and disinfection includes all references within these specifications, including the Chicago Department of Water Management's Technical Specifications for Water Main Construction, as well as additional tests and procedures requested by the Engineer or CDWM in advance of acceptance.

Thrust blocks will be paid for separately.

Method of Measurement. WATER MAIN RELOCATION 54" (CDWM) will not be measured for payment.

Basis of Payment. The Work under this Item shall be paid for at the Contract lump sum cost for WATER MAIN RELOCATION 54" (CDWM). Unless otherwise noted, the cost of all labor, equipment and materials, polyethylene encasement, joint restraint, shut down, dewatering, filling, flushing, pressure testing and disinfection required for a complete and operational installation, removal and proper disposal offsite of excavated material, trench and stockpile protection (fencing), bedding and granular trench backfill for water main trench shall be included in the cost of WATER MAIN RELOCATION 54" (CDWM).

## **GENERAL ELECTRICAL REQUIREMENTS**

Effective: January 1, 2012

Add the following to Article 801 of the Standard Specifications:

"Maintenance transfer and Preconstruction Inspection:

General. Before performing any excavation, removal, or installation work (electrical or otherwise) at the site, the Contractor shall request a maintenance transfer and preconstruction site inspection, to be held in the presence of the Engineer and a representative of the party or parties responsible for maintenance of any lighting and/or traffic control systems which may be affected by the work. The request for the maintenance transfer and preconstruction inspection shall be made no less than seven (7) calendar days prior to the desired inspection date. The maintenance transfer and preconstruction inspection shall:

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

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

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

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

Add the following to the 1<sup>st</sup> paragraph of Article 801.05(a) of the Standard Specifications:

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

Revise the second sentence of the 5<sup>th</sup> paragraph of Article 801.05(a) of the Standard Specifications to read:

"The Engineer will stamp the submittals indicating their status as 'Approved', 'Approved as Noted', 'Disapproved', or 'Information Only'.

Revise the 6<sup>th</sup> paragraph of Article 801.05(a) of the Standard Specifications to read:

"Resubmittals. All submitted items reviewed and marked 'Approved as Noted', or 'Disapproved' are to be resubmitted in their entirety with a disposition of previous comments to verify contract compliance at no additional cost to the state unless otherwise indicated within the submittal comments."

Revise Article 801.11(a) of the Standard Specifications to read:

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

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

Add the following to Section 801 of the Standard Specifications:

“Lighting Cable Identification. Each wire installed shall be identified with its complete circuit number at each termination, splice, junction box or other location where the wire is accessible.”

“Lighting Cable Fuse Installation. Standard fuse holders shall be used on non-frangible (non-breakaway) light pole installations and quick-disconnect fuse holders shall be used on frangible (breakaway) light pole installations. Wires shall be carefully stripped only as far as needed for connection to the device. Over-stripping shall be avoided. An oxide inhibiting lubricant shall be applied to the wire for minimum connection resistance before the terminals are crimped-on. Crimping shall be performed in accordance with the fuse holder manufacturer's recommendations. The exposed metal connecting portion of the assembly shall be taped with two half-lapped wraps of electrical tape and then covered by the specified insulating boot. The fuse holder shall be installed such that the fuse side is connected to the pole wire (load side) and the receptacle side of the holder is connected to the line side.”

Revise the 2<sup>nd</sup> paragraph of Article 801.16 of the Standard Specifications to read:

“When the work is complete, and seven days before the request for a final inspection, the full-size set of contract drawings. Stamped “RECORD DRAWINGS”, shall be submitted to the Engineer for review and approval and shall be stamped with the date and the signature of the Contractor’s supervising Engineer or electrician. The record drawings shall be submitted in PDF format on CDROM as well as hardcopy for review and approval. In addition to the record drawings, copies of the final catalog cuts which have been Approved or Approved as Noted shall be submitted in PDF format along with the record drawings. The PDF files shall clearly indicate either by filename or PDF table of contents the respective pay item number. Specific part or model numbers of items which have been selected shall be clearly visible.”

Add the following to Article 801.16 of the Standard Specifications:

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

- Last light pole on each circuit
- Handholes
- Conduit roadway crossings
- Controllers
- Control Buildings
- Structures with electrical connections, i.e. DMS, lighted signs.
- Electric Service locations
- CCTV Camera installations
- Fiber Optic Splice Locations

Datum to be used shall be North American 1983.

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

1. Description of item
2. Designation or approximate station if the item is undesignated
3. Latitude
4. Longitude

Examples:

Equipment Description	Equipment Designation	Latitude	Longitude
CCTV Camera pole	ST42	41.580493	-87.793378
FO mainline splice handhole	HHL-ST31	41.558532	-87.792571
Handhole	HH at STA 234+35	41.765532	-87.543571
Electric Service	Elec Srv	41.602248	-87.794053
Conduit crossing	SB IL83 to EB I290 ramp SIDE A	41.584593	-87.793378
Conduit crossing	SB IL83 to EB I290 ramp SIDE B	41.584600	-87.793432
Light Pole	DA03	41.558532	-87.792571
Lighting Controller	X	41.651848	-87.762053
Sign Structure	FGD	41.580493	-87.793378
Video Collection Point	VCP-IK	41.558532	-87.789771
Fiber splice connection	Toll Plaza34	41.606928	-87.794053

Prior to the collection of data, the contractor shall provide a sample data collection of at least six data points of known locations to be reviewed and verified by the Engineer to be accurate within 100 feet. Upon verification, data collection can begin. Data collection can be made as construction progresses, or can be collected after all items are installed. If the data is unacceptable the contractor shall make corrections to the data collection equipment and or process and submit the data for review and approval as specified.

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

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

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

### **ELECTRIC UTILITY SERVICE CONNECTION (COMED)**

Effective: January 1, 2012

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



## CONSTRUCTION REQUIREMENTS

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

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

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

For bidding purposes, this item shall be estimated as \$15,000.00

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

Designers Note: The estimate of cost of service connections for bidding purposes shall be provided by the Designer or Design Consultant.

### **ELECTRIC SERVICE INSTALLATION**

Effective: January 1, 2012

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

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

## CONSTRUCTION REQUIREMENTS

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

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

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

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

### **UNDERPASS LUMINAIRE, HPS, STAINLESS STEEL HOUSING**

Effective: January 1, 2012

Description. This item shall consist of furnishing, testing as required, and installing a luminaire suitable for roadway underpasses as specified herein.

General. The luminaire shall be optically sealed, mechanically strong and easy to maintain.

All wiring within the fixture shall have a minimum temperature rating of 125° C. In addition, the unit shall be designed to allow for a maximum supply wire rating of 90° C.

All hardware of the housing, reflector, and ballast assembly shall be captive.

The luminaire shall be UL Listed for Wet Locations.

The underpass luminaire shall be suitable for lighting a roadway underpass at approximate mounting height of 16 feet from a position suspended directly above the roadway.

The luminaire shall be certified by the U.L. testing laboratory to meet the IP66 criteria of the International Electro technical Commission Standard 529.

Housing. The housing shall be stainless steel and be made of 16 gauge minimum thickness stainless steel, Type 304, #2B finish.

Since the installed location of the luminaires has severe space limitations that prohibit servicing the luminaire from the top or side of the fixture, the luminaire must be serviceable from the bottom of the housing when in the installed position. Both ballast and optical compartments must be serviceable from the bottom of the fixture. Fixtures which open from the top or sides are not acceptable.

The housing shall have a maximum width of 13"

All internal and external hardware, unless specifically specified otherwise, shall be made of stainless steel.

#### Stainless Steel Housing

The stainless steel housing, and lens frame shall be made of 16 gauge minimum thickness stainless steel, Type 304 #2B.

All housing and frame components shall be cut within with a laser with a positioning accuracy of +/- .004" for assembly accuracy and machine welded to minimize irregularities in the weld joint.

All seams in the housing enclosure shall be welded by continuous welding. Stainless steel weld wire shall be used for all welds. A sample weld shall be submitted for review and approval.

The luminaire lens shall be flush, within 3.1 mm (0.122"), of the lens frame.

The lens frame shall be flat and the frame and luminaire housing shall not have any protruding flanges.

The lens frame assembly shall consist of a one-piece 16 gauge 304 stainless steel external frame with the lens facing toward the housing and a 16 gauge 304 stainless internal frame with the legs facing away from the housing. The internal frame shall have seam welded corners for added strength. The two panels will sandwich the glass lens and be fastened together with the use of no less than 10 #10 stainless steel fasteners.

The lens frame and the door frame shall each be secured through the use of two stainless steel draw latches secured to the fixture housing.

When in open position, it shall be possible to un-hinge and remove the lens frame for maintenance. The lens frame hinge shall be stainless steel and designed so that there must be a conscious action of the maintenance personnel to remove the lens frame. The frame hinging method shall not be designed so that bumping the frame accidentally could allow the frame to fall to the roadway surface. The removal method must be accomplished without the use of tools or hardware. The hinge pin shall be a minimum of 6.35 mm (0.250") in diameter. The pin shall be spring loaded and retractable with a safety catch to hold the pin in the retracted position for ease of maintenance.

The suspended housing shall be divided into two compartments, one for the ballast and optical assembly, the other for wire connections. The optical chamber shall be sealed from the environment. The wire portal between compartments shall be sealed so as to prevent air exchange through the portal. There shall be an internally mounted breather mechanism to allow internal and external air pressure to equalize without permitting dust or water into the unit.

The ballast and all electrical equipment shall be mounted to a removable aluminum chassis with a minimum thickness of 3.175, (0.125"). The chassis shall be held in place with captive stainless steel hardware. The hardware shall include a bracket that can be loosened and shifted to allow the chassis to pivot away from fastened position for removal. The splice box shall include a heavy-duty 3 pole terminal block to accommodate #6 conductors and a KTK 2 amp fuse with HPC fuse holder or approved equal. Quick-connect power distribution terminal blocks shall be a molded thermoset plastic, rated 70A, 600V and have 3 poles, each with (4) .250 quick connect terminals. Operating temperature rating to be 150° C. Input wire size shall accommodate #2-#14 AWG. Torque rating shall be 45 in./lb. Maximum. Agency approvals shall be UL E62622; CSA LR15364.

Ballast compartment surfaces shall be deburred and free of sharp edges, points or corners that may come in contact with installers or service personnel.

Gasketing. The junction between the lens frame and the ballast housing door and the housing shall be sealed with a one-piece vulcanized or molded high temperature solid silicone rubber gasket with the equivalent of a 60 Shore A durometer rating. The gasket between the lens frame and the luminaire housing shall be securely attached by mechanical means, such a retaining lip to prevent the movement of the gasket. The gasket may not be secured by adhesive means exclusively. The lens and ballast housing doors shall be designed and constructed so they seal to the gasket on a flat surface. The frame shall not seal to the gasket using the edge of leg on a doorframe. The lens shall be sealed inside of the lens frame with the use of a one-piece solid silicone rubber gasket with ribbed flanges and a rating of 60 Shore A Durometer

The junction between conduit connections to the luminaire and the lens frame junction to the housing shall withstand entry of water when subjected to a water jet pressure of 207 kPa (30 lbs. Per sq. inch), tested under laboratory conditions. Submittal information shall include data relative to gasket thickness and density and the means of securing it in place.

Mounting Brackets. The brackets shall be properly sized to accommodate the weight of the luminaire with calculations or other suitable reference documentation submitted to support the material choice.

The luminaire shall have an opening in the housing for installation (by others) of a 28.1 mm (3/4 inch) diameter flexible conduit. The location of the opening will be determined by the Engineer during the shop drawing review.

Lamp Socket. The lamp socket shall be a 4KV pulse rated mogul type, porcelain glazed enclosed, and be provided with grips, or other suitable means to hold the lamp against vibration. The rating of the socket shall exceed the lamp starting voltage, or starting pulse voltage rating.

If the lamp socket is of the sealed removable type, proper alignment of the socket shall be provided and molded into the socket assembly and indicated in a contrasting color.

If the lamp socket is adjustable, the factory setting must be indicated legibly in the luminaire housing.

ANSI Identification Decal. A decal, complying to ANSI standard C136-15 for luminaire wattage and distribution type, shall be factory attached permanently to the luminaire. The information contained in the decal shall enable a viewer, from the ground level, to identify the lamp wattage and type of luminaire distribution.

Optical Assembly. Lens and Lens Frame. The lens shall be made of crystal clear, impact and heat resistant tempered glass a minimum of 6.35 mm (0.25") thick. The lens shall be held in such a manner as to allow for its expansion and contraction, due to temperature variation. The lens shall be a flat glass design.

Reflector. The reflector shall be hydro formed aluminum, 0.063" thick, bright-dip and clear anodized finish.

The reflector shall be secured with a stainless steel aircraft cable during maintenance operations.

If the reflector has multiple light distribution positions, each position must have positive stop/mounting with the original factory distribution identified.

The luminaire shall be photometrically efficient. Luminaire efficiency, defined by the I.E.S. as "the ratio or luminous flux (lumens) emitted by a luminaire to that emitted by the lamp or lamps used within", shall not be less than 67%. Submittal information shall include published efficiency data.

The reflector, the refractor or lens, and the entire optical assembly shall not develop any discoloration over the normal life span of the luminaire.

The reflector shall not be altered by paint or other opaque coatings which would cover or coat the reflecting surface. Control of the light distribution by any method other than the reflecting material and the aforementioned clear protective coating that will alter the reflective properties of the reflecting surface is unacceptable

Ballast. The ballast shall be a High Pressure Sodium, high power factor, lead type, Isolated Regulator Ballast (CWI) or a Constant Wattage Auto-regulator (CWA), for operation on a nominal 240 volt system.

The ballast shall be designed to furnish proper electrical characteristics for starting and operating a high pressure sodium vapor lamp of the specified rating at ambient temperatures of -29 degrees to +40 degrees C. The ballast windings shall be adequately impregnated and treated for protection against the entrance of moisture, insulated with Class H insulation, and able to withstand the NEMA standard dielectric test.

The ballast shall include an electronic starting assembly. The starter assembly shall be comprised of solid state devices capable of withstanding ambient temperatures of 85 degrees C. The starter shall provide timed pulsing with sufficient follow-through current to completely ionize and start all lamps. Minimum amplitude of the pulse shall be 2,500 volts, with a width of one (1) microsecond at 2,250 volts, and shall be applied within 20 electrical degrees of the peak of the open circuit voltage wave with a repetition rate as recommended by the lamp manufacturer for the 60 cycle wave. The lamp peak pulse current shall be a minimum of 0.2 amperes. Proper ignition shall be provided over a range of input voltage from 216 to 264 volts. The starter component shall be field replaceable and completely interchangeable with no adjustment necessary for proper operation. The starter component shall have push-on type electrical terminations to provide good electrical and mechanical integrity and ease of replacement. Terminal configuration shall preclude improper insertion of plug-in components. The starter circuit board shall be treated in an approved manner to provide a water and contaminant-resistant coating.

The ballast shall have an overall power factor of at least 0.9 when operated under rated lamp load.

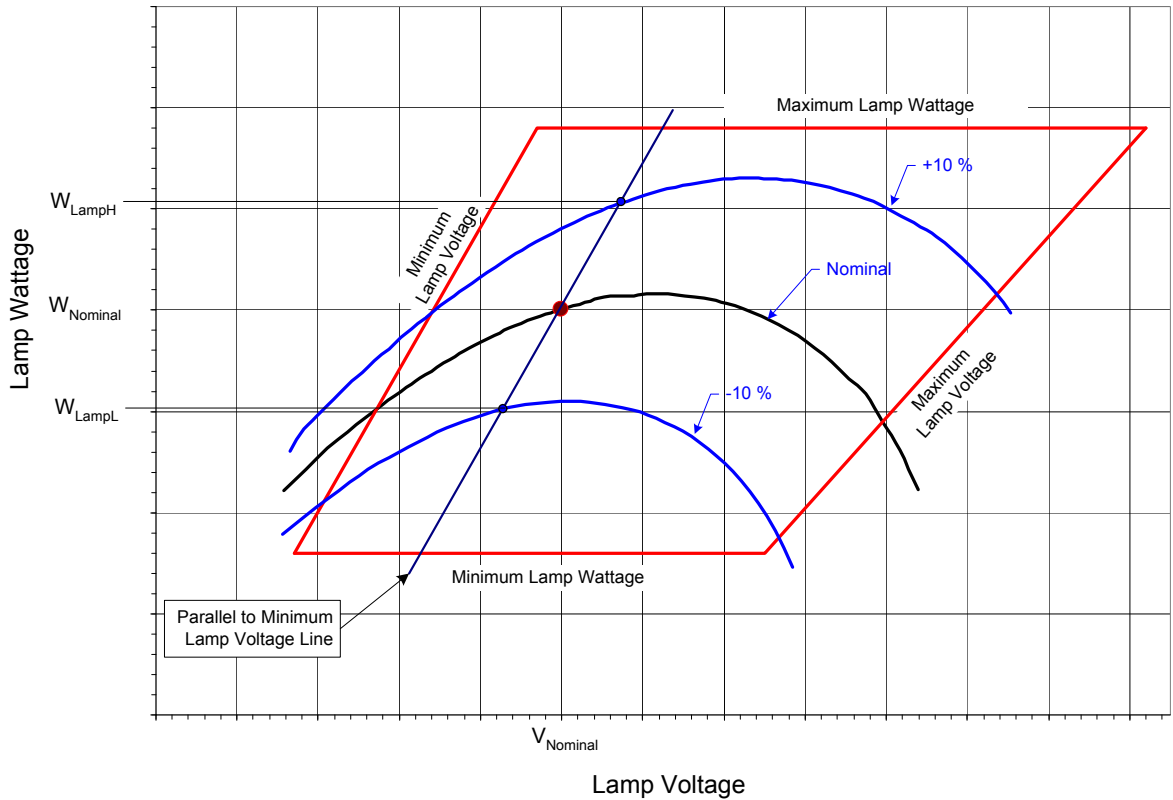
The ballast shall withstand a 2,500 volt dielectric test between the core and windings without damage to the insulation.

The ballast shall not subject the lamp to a crest factor exceeding 1.8 and shall operate the lamp without affecting adversely the lamp life and performance.

The ballast shall be designed to ANSI Standards and shall be designed and rated for operation on a nominal 240 volt system. The ballast shall provide positive lamp ignition at the input voltage of 216 volts. It shall operate the lamp over a range of input voltages from 216 to 264 volts without damage to the ballast. It shall provide lamp operation within lamp specifications for rated lamp life at input design voltage range. Operating characteristics shall produce output regulation not exceeding the following values:

<b>Nominal Ballast Wattage</b>	<b>Maximum Ballast Regulation</b>
400	25%
310	26%
250	22%
150	22%
70	17%

For this measure, regulation shall be defined as the ratio of the lamp watt difference between the upper and lower operating curves to the nominal lamp watts; with the lamp watt difference taken within the ANSI trapezoid at the nominal lamp operating voltage point parallel to the minimum lamp volt line:



$$\text{Ballast Regulation} = \frac{W_{LampH} - W_{LampL}}{W_{LampN}} \times 100$$

where:

$W_{LampH}$  = lamp watts at +10% line voltage (264v)

$W_{LampL}$  = lamp watts at - 10% line voltage (216v)

$W_{lampN}$  = lamp watts at 240v"

Ballast losses, based on cold bench tests, shall not exceed the following values:

Nominal Ballast Wattage	Maximum Ballast Losses
400	16.0%
310	19.0%
250	17.5%
150	26.0%
70	34.0%

Ballast losses shall be calculated based on input watts and lamp watts at nominal system voltage as indicated in the following equation:

$$\text{Ballast Losses} = \frac{W_{Line} - W_{Lamp}}{W_{Lamp}} \times 100$$

where:

$W_{line}$  = line watts at 240v

$W_{lamp}$  = lamp watts at 240v

Ballast output to lamp. At nominal system voltage and a lamp voltage of 52v, the ballast shall deliver a lamp wattage within  $\pm 4\%$  of the nominal lamp wattage. For a 70w luminaire, the ballast shall deliver 70 watts  $\pm 4\%$  at a lamp voltage of 52v for the nominal system voltage of 240v.

Ballast output over lamp life. Over the life of the lamp the ballast shall produce an average of the nominal lamp rating  $\pm 5\%$ . Lamp wattage readings shall be taken at 5-volt increments throughout the ballast trapezoid. The lamp wattage values shall then be averaged within the trapezoid and shall be within  $\pm 5\%$  of the nominal ballast rating. Submittal documents shall include a tabulation of the lamp wattage vs. lamp voltage readings.

The ballast shall be integral to the luminaire. The ballast components shall be mounted on a removable door or on a removable mounting tray. The ballast tray or mounting door shall be manufactured with dissimilar metal conflicts kept to a minimum.

Ballast wiring and lamp socket wiring shall be connected by means of keyed plugs. Upon unplugging the ballast wiring the entire ballast assembly shall be removable for maintenance. The plugs shall not be interchangeable to avoid improper connection of the assemblies.

The mounting adjustments and wiring terminals shall be readily accessible. The removable door or pad shall be secure when fastened in place and all individual components shall be secure upon the removable element. Upon ballast assembly removal, each component shall be readily removable for replacement.

The luminaire shall be completely wired. All wiring connections within the luminaire shall be made with insulated compression connectors or insulated terminal blocks. An insulated terminal block shall be provided to terminate the incoming supply wires. The terminal block shall be rated for 600 volts and shall accommodate wire sizes from #10 to #6 AWG. The use of "wire nuts" is unacceptable. A ground terminal shall be provided for the connection of a ground wire.

Ballast and lamp Leads shall not be smaller than #16 AWG conductors rated at a minimum temperature rating of 90° C.

All wires shall be coded by tagging and/or color coding for proper identification. A complete legible permanently attached wiring diagram (no smaller than 3" x 4" with a min. font size of 8 pts.) coordinated with the wire identifications shall be displayed at the convenient location on the interior of the luminaire. The wiring diagram shall be oriented so that it is right side up and readable when the luminaire is in the installed position.

The ballast shall not be excessively noisy. Noticeable noisy ballasts, as determined by the Engineer, shall be replaced at no additional cost to the State.



The ballast shall provide lamp operation within lamp specifications for the rated lamp life at the input design voltage range. It shall have a 6 month operation capability with a cycling lamp.

Submittal information shall include manufacturer's literature and data to confirm compliance with all specified requirements including an ANSI Standard Ballast Characteristic Graph (Trapezoid) diagram, with all items clearly identified.

Photometric Performance. The luminaire photometric performance shall produce results equal to or better than those listed in the included Luminaire Performance Table. Submittal information shall include computer calculations based on the controlling given conditions which demonstrate achievement of all listed performance requirements. The computer calculations shall be done according to I.E.S. recommendations and the submitted calculations shall include point-by-point illuminance, luminance and veiling luminance as well as listings of all indicated averages and ratios as applicable. Calculations shall be performed with AGI32. The program used to perform the calculations shall be identified on the submittal. The submittal data shall also include all photometric calculations files with the proposed photometric data on a CD ROM. The performance requirements shall define the minimum number of decimal places used in the calculations. Rounding of calculations shall not be allowed.

In addition to computer printouts of photometric performance, submittal information shall include: Descriptive literature; an Isofootcandle chart of horizontal lux (footcandles); Utilization curve; Isocandela diagram; Luminaire classification per ANSI designation; Candlepower values at every 2.5 degree intervals; Candlepower tables are to be provided on CD ROM in the IES format as specified in IES publication LM-63.

**IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE #1  
 5 Lane Cross Section**

<b>GIVEN CONDITIONS</b>		
<b>ROADWAY DATA</b>	Pavement Width	60 ft
	Number of Lanes	5
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
<b>LIGHT POLE DATA</b>	Mounting Height	16 ft
	Mast Arm Length	0 ft
	Pole Set-Back From Edge of Pavement	2 ft
<b>LUMINAIRE DATA</b>	Lamp Type	HPS
	Lamp Lumens	9,500
	I.E.S. Vertical Distribution	Medium
	I.E.S. Control Of Distribution	Cutoff
	I.E.S. Lateral Distribution	IV
	Total Light Loss Factor	0.65
<b>LAYOUT DATA</b>	Spacing	35 ft
	Configuration	Opposite Side
	Luminaire Overhang over edge of pavement	-2 ft

**NOTE:** Variations from the above specified I.E.S. distribution pattern may be requested and acceptance of variations will be subject to review by the Engineer based on how well the performance requirements are met.

<b>PERFORMANCE REQUIREMENTS</b>		
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**NOTE:** These performance requirements shall be the minimum acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

<b>ILLUMINATION</b>	Ave. Horizontal Illumination, $E_{AVE}$	18 Lux
	Uniformity Ratio, $E_{AVE}/E_{MIN}$	2.5:1
<b>LUMINANCE</b>	Average Luminance, $L_{AVE}$	1.2 Cd/m <sup>2</sup>
	Uniformity Ratio, $L_{AVE}/L_{MIN}$	2.5:1 (Max)
	Uniformity Ratio, $L_{MAX}/L_{MIN}$	4:1 (Max)
	Veiling Luminance Ratio, $L_V/L_{AVE}$	0.25:1 (Max)

**IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE #2**  
**4 Lane Cross Section**

GIVEN CONDITIONS		
<b>ROADWAY DATA</b>	Pavement Width	48 ft
	Number of Lanes	4
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
<b>LIGHT POLE DATA</b>	Mounting Height	16 ft
	Mast Arm Length	0 ft
	Pole Set-Back From Edge of Pavement	2 ft
<b>LUMINAIRE DATA</b>	Lamp Type	HPS
	Lamp Lumens	9,500
	I.E.S. Vertical Distribution	Medium
	I.E.S. Control Of Distribution	Cutoff
	I.E.S. Lateral Distribution	IV
	Total Light Loss Factor	0.65
<b>LAYOUT DATA</b>	Spacing	35 ft
	Configuration	Opposite Side
	Luminaire Overhang over edge of pavement	-2 ft

**NOTE:** Variations from the above specified I.E.S. distribution pattern may be requested and acceptance of variations will be subject to review by the Engineer based on how well the performance requirements are met.

PERFORMANCE REQUIREMENTS		
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**NOTE:** These performance requirements shall be the minimum acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

<b>ILLUMINATION</b>	Ave. Horizontal Illumination, $E_{AVE}$	18 Lux
	Uniformity Ratio, $E_{AVE}/E_{MIN}$	2.5:1
<b>LUMINANCE</b>	Average Luminance, $L_{AVE}$	1.2 Cd/m <sup>2</sup>
	Uniformity Ratio, $L_{AVE}/L_{MIN}$	2.5:1
	Uniformity Ratio, $L_{MAX}/L_{MIN}$	4:1
	Veiling Luminance Ratio, $L_V/L_{AVE}$	0.25:1

**IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE #3  
 3 Lane Cross Section**

GIVEN CONDITIONS		
<b>ROADWAY DATA</b>	Pavement Width	36 ft
	Number of Lanes	3
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
<b>LIGHT POLE DATA</b>	Mounting Height	16 ft
	Mast Arm Length	0 ft
	Pole Set-Back From Edge of Pavement	2 ft
<b>LUMINAIRE DATA</b>	Lamp Type	HPS
	Lamp Lumens	6,300
	I.E.S. Vertical Distribution	Medium
	I.E.S. Control Of Distribution	Cutoff
	I.E.S. Lateral Distribution	III
	Total Light Loss Factor	0.65
<b>LAYOUT DATA</b>	Spacing	45 ft
	Configuration	Opposite Side
	Luminaire Overhang over edge of pavement	-2 ft

**NOTE:** Variations from the above specified I.E.S. distribution pattern may be requested and acceptance of variations will be subject to review by the Engineer based on how well the performance requirements are met.

PERFORMANCE REQUIREMENTS		
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**NOTE:** These performance requirements shall be the minimum acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

<b>ILLUMINATION</b>	Ave. Horizontal Illumination, $E_{AVE}$	18 Lux
	Uniformity Ratio, $E_{AVE}/E_{MIN}$	2.5:1
<b>LUMINANCE</b>	Average Luminance, $L_{AVE}$	1.2 Cd/m <sup>2</sup>
	Uniformity Ratio, $L_{AVE}/L_{MIN}$	2.5:1
	Uniformity Ratio, $L_{MAX}/L_{MIN}$	4:1
	Veiling Luminance Ratio, $L_V/L_{AVE}$	0.30:1

**IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE #4  
 2 Lane Cross Section**

GIVEN CONDITIONS		
<b>ROADWAY DATA</b>	Pavement Width	24 ft
	Number of Lanes	2
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
<b>LIGHT POLE DATA</b>	Mounting Height	16 ft
	Mast Arm Length	0 ft
	Pole Set-Back From Edge of Pavement	2 ft
<b>LUMINAIRE DATA</b>	Lamp Type	HPS
	Lamp Lumens	6,300
	I.E.S. Vertical Distribution	Medium
	I.E.S. Control Of Distribution	Cutoff
	I.E.S. Lateral Distribution	III
	Total Light Loss Factor	0.65
<b>LAYOUT DATA</b>	Spacing	30 ft
	Configuration	Single Side
	Luminaire Overhang over edge of pavement	-2 ft

**NOTE:** Variations from the above specified I.E.S. distribution pattern may be requested and acceptance of variations will be subject to review by the Engineer based on how well the performance requirements are met.

PERFORMANCE REQUIREMENTS		
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**NOTE:** These performance requirements shall be the minimum acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

<b>ILLUMINATION</b>	Ave. Horizontal Illumination, $E_{AVE}$	18 Lux
	Uniformity Ratio, $E_{AVE}/E_{MIN}$	3:1
<b>LUMINANCE</b>	Average Luminance, $L_{AVE}$	1.2 Cd/m <sup>2</sup>
	Uniformity Ratio, $L_{AVE}/L_{MIN}$	3:1
	Uniformity Ratio, $L_{MAX}/L_{MIN}$	5:1
	Veiling Luminance Ratio, $L_V/L_{AVE}$	0.30:1

**IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE #5**  
**1 Lane Cross Section**

GIVEN CONDITIONS		
<b>ROADWAY DATA</b>	Pavement Width	16 ft
	Number of Lanes	1
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
<b>LIGHT POLE DATA</b>	Mounting Height	16 ft
	Mast Arm Length	0 ft
	Pole Set-Back From Edge of Pavement	5 ft
<b>LUMINAIRE DATA</b>	Lamp Type	HPS
	Lamp Lumens	6,300
	I.E.S. Vertical Distribution	Medium
	I.E.S. Control Of Distribution	Cutoff
	I.E.S. Lateral Distribution	III
	Total Light Loss Factor	0.65
<b>LAYOUT DATA</b>	Spacing	35 ft
	Configuration	Single Side
	Luminaire Overhang over edge of pavement	-5 ft

**NOTE:** Variations from the above specified I.E.S. distribution pattern may be requested and acceptance of variations will be subject to review by the Engineer based on how well the performance requirements are met.

PERFORMANCE REQUIREMENTS		
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**NOTE:** These performance requirements shall be the minimum acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

<b>ILLUMINATION</b>	Ave. Horizontal Illumination, $E_{AVE}$	18 Lux
	Uniformity Ratio, $E_{AVE}/E_{MIN}$	2.5:1
<b>LUMINANCE</b>	Average Luminance, $L_{AVE}$	1.2 Cd/m <sup>2</sup>
	Uniformity Ratio, $L_{AVE}/L_{MIN}$	2.5:1
	Uniformity Ratio, $L_{MAX}/L_{MIN}$	4:1
	Veiling Luminance Ratio, $L_V/L_{AVE}$	0.30:1

Independent Testing. Independent testing of luminaires shall be required whenever the quantity of luminaires of a given wattage and distribution, as indicated on the plans, is 50 or more. For each luminaire type to be so tested, one luminaire plus one luminaire for each 50 luminaires shall be tested. Example: *A plan quantity of 75 luminaires would dictate that 2 to be tested; 135 luminaires would dictate that three be tested.*

The Contractor shall be responsible for all costs associated with the specified testing, including but not limited to shipping, travel and lodging costs as well as the costs of the tests themselves, all as part of the bid unit price for this item. Travel, lodging and other associated costs for travel by the Engineer shall be direct-billed to or shall be pre-paid by the Contractor, requiring no direct reimbursement to the Engineer or the independent witness, as applicable.

Commitment to test. The Vendor shall select one of the following options for the required testing with the Engineer's approval:

Engineer Factory Selection for Independent Lab: The Contractor may select this option if the luminaire manufacturing facility is within the state of Illinois. The Contractor shall propose an independent test laboratory for approval by the Engineer. The selected luminaires shall be marked by the Engineer and shipped to the independent laboratory for tests.

Engineer Witness of Independent Lab Test: The Contractor may select this option if the independent testing laboratory is within the state of Illinois. The Engineer shall select, from the project luminaires at the manufacturer's facility or at the Contractor's storage facility, luminaires for testing by the independent laboratory.

Independent Witness of Manufacturer Testing: The independent witness shall select from the project luminaires at the manufacturer's facility or at the Contractor's storage facility, the luminaires for testing. The Contractor shall propose a qualified independent agent, familiar with the luminaire requirements and test procedures, for approval by the Engineer, to witness the required tests as performed by the luminaire manufacturer. The independent witness shall:

- ▶ Have been involved with roadway lighting design for at least 15 years.
- ▶ Not have been the employee of a luminaire or ballast manufacturer within the last 5 years.
- ▶ Be a member of IESNA in good standing.
- ▶ Provide a list of professional references.

Engineer Factory Selection and Witness of Manufacturer Testing: The Contractor may select this option if the manufacturing facility is within the state of Illinois. At the manufacturer's facility, the Engineer shall select the luminaires to be tested and shall be present during the testing process. The Contractor shall schedule travel by the Engineer to and from the Manufacturer's laboratory to witness the performance of the required tests.

In all cases, the selection of luminaires shall be a random selection from the entire completed lot of luminaires required for the contract. Selections from partial lots will not be allowed. The selection of the testing option shall be presented with the information submitted for approval. The proposed independent laboratory or independent witness shall be included with that information. The selection of the testing option shall be presented with the information submitted for approval. The proposed independent laboratory or independent witness shall be included with that information.

The testing performed shall include photometric, electrical, heat and water jet testing.

Photometric testing shall be in accordance with IES recommendations except that the selected luminaire(s) shall be tested as manufactured without any disassembly or modification and, as a minimum shall yield an isofotcandle chart, with max candela point and half candela trace indicated, an isocandela diagram, maximum plane and cone plots of candela, a candlepower table (house and street side), a coefficient of utilization chart, a luminous flux distribution table, and complete calculations based on specified requirements and tests.

Electrical testing shall conform to NEMA and ANSI standards and as a minimum, shall yield a complete check of wiring connections, a ballast dielectric test, total ballast losses in watts and percent of input, a lamp volt-watt trace, regulation data, a starter test, lamp current crest factor, power factor (minimum over the design range of input voltage at nominal lamp voltage) and, a table of ballast characteristics showing input amperes, watts and power factor, output volts, amperes, watts and lamp crest factor as well as ballast losses over the range of values required to produce the lamp volt-watt trace. Ballast test data shall also be provided in an electronic format acceptable to the Engineer to demonstrate compliance with sections 9.7, 9.8, 9.9 and 9.10.

Heat Testing. Heat testing shall be conducted to ensure that the luminaire complies with UL 1572. An ambient temperature of 40 degrees centigrade (104 degrees F) shall be used for the test.

Water spray test. The luminaires must pass the following water spray test.:

A spray apparatus consisting of four spray nozzles set at an angle of 30 degrees from the vertical plane space 30 inches apart on a 2 inch pipe, each delivering 12 gallons of water per minute at a minimum of 100 psi at each nozzle in a 90 degree cone. A water pressure gauge shall be installed at the first nozzle.

The luminaires shall be mounted in a ceiling configuration and with each nozzle set a distance of 18 inches below the fixture in the vertical plane and 18 inches away in the horizontal plane from the fixture lens, apply spray for a duration of 3 minutes at a minimum of 100 psi. When opened, the fixture shall not show any signs of leakage.

The above test shall be repeated in the opposite horizontal plane from the fixture lens with no signs of leakage.

The summary report and the test results shall be certified by the independent test laboratory or the independent witness, as applicable, and shall be sent by certified mail directly to the Engineer. A copy of this material shall be sent to the Contractor and luminaire manufacturer at the same time.



Should any of the tested luminaires of a given distribution type and wattage fail to satisfy the specifications and perform according to approved submittal information, the luminaire of that distribution type and wattage shall be unacceptable and be replaced by alternate equipment meeting the specifications with the submittal and testing process repeated in their entirety; or corrections made to achieve required performance. In the case of corrections, the Vendor shall advise the Engineer of corrections made and shall request a repeat of the specified testing and, if the corrections are deemed reasonable by the Engineer, the testing process shall be repeated. The number of luminaires to be tested shall be the same quantity as originally tested. Luminaires which are not modified or corrected shall not be re-tested without prior approval from the Engineer.

Coordination shall be the Vendor's responsibility. Failure to coordinate arrangements and notice shall not be grounds for additional compensation or extension of time.

Submittal information shall include a statement of intent to provide the testing as well as a request for approval of the chosen laboratory.

Installation. Underpass luminaires shall be either attached to structures (such as piers, etc.) or suspended from structures (such as bridge decks) as indicated or implied by the configuration on the Plans. Mounting, including all hardware and appurent items, shall be included as part of this item.

Unless otherwise indicated, suspended underpass luminaires shall be installed one-inch above the lowest underpass beam and shall be mounted using vibration dampening assemblies. All mounting hardware shall be corrosion resistant and shall be stainless steel unless otherwise indicated.

The Engineer reserves the right to select the final light distribution pattern, luminaire aiming angle and change it as deemed necessary to produce the proper pavement luminance.

Surface mounted luminaires, all luminaires not mounted on suspension rods, shall have one-inch thick stainless steel spacers installed between the luminaire and the deck or wall.

Guarantee. The Vendor shall provide a written guarantee for materials, and workmanship for a period of 6 months after final acceptable of the lighting system.

Documentation. All instruction sheets required to be furnished by the manufacturer for materials and supplies and for operation of the equipment shall be delivered to the Engineer.

The manufacturer shall have been incorporated for at least five years and shall have at least five years in the design and manufacturing of roadway underpass lighting. The manufacturer shall provide evidence of financial strength to finance the production of the project by submitting the name of at least three projects completed in the previous calendar year of greater than \$250,000 each. All steel used in the project shall be certified to be provided domestically, and all fixture components used shall be manufactured domestically.

Method of Measurement. Luminaires shall be counted, each.

Basis of Payment. This item shall be paid at the contract unit price each for UNDERPASS LUMINAIRE, of the wattage specified, HIGH PRESSURE SODIUM VAPOR, which shall be payment in full for the material and work described herein.

### **MAINTENANCE OF LIGHTING SYSTEMS**

Effective: January 1, 2012

Replace Article 801.11 and 801.12 of the Standard Specifications with the following:

Effective the date the Contractor's activities (electrical or otherwise) at the job site begin, the Contractor shall be responsible for the proper operation and maintenance of all existing and proposed lighting systems which are part of, or which may be affected by the work until final acceptance or as otherwise determined by the Engineer.

The Contractor shall be responsible for the proper operation and maintenance of the following existing and proposed lighting systems under this contract:

- Existing IDOT Lighting Controller 'D'; Circuits G and H.
- Existing IDOT Lighting Controller 'Z'; Circuits A, B, C and D.

Before performing any excavation, removal, or installation work (electrical or otherwise) at the site, the Contractor shall initiate a request for a maintenance transfer and preconstruction inspection, as specified elsewhere herein, to be held in the presence of the Engineer and a representative of the party or parties responsible for maintenance of any lighting systems which may be affected by the work. The request for the maintenance preconstruction inspection shall be made no less than seven (7) calendar days prior to the desired inspection date.

Existing lighting systems, when depicted on the plans, are intended only to indicate the general equipment installation of the systems involved and shall not be construed as an exact representation of the field conditions. It remains the Contractor's responsibility to visit the site to confirm and ascertain the exact condition of the electrical equipment and systems to be maintained.

### **Maintenance of Existing Lighting Systems**

**Existing lighting systems.** Existing lighting systems shall be defined as any lighting system or part of a lighting system in service at the time of contract Letting. The contract drawings indicate the general extent of any existing lighting, but whether indicated or not, it remains the Contractor's responsibility to ascertain the extent of effort required for compliance with these specifications and failure to do so will not be justification for extra payment or reduced responsibilities.

### **Extent of Maintenance.**

**Partial Maintenance.** Unless otherwise indicated, if the number of circuits affected by the contract is equal to or less than 40% of the total number of circuits in a given controller and the controller is not part of the contract work, the Contractor needs only to maintain the affected circuits. The affected circuits shall be isolated by means of in-line waterproof fuse holders as specified elsewhere and as approved by the Engineer.

**Full Maintenance.** If the number of circuits affected by the contract is greater than 40% of the total number of circuits in a given controller, or if the controller is modified in any way under the contract work, the Contractor shall maintain the entire controller and all associated circuits.

### **Maintenance of Proposed Lighting Systems**

**Proposed Lighting Systems.** Proposed lighting systems shall be defined as any lighting system or part of a lighting system, temporary or permanent, which is to be constructed under this contract.

The Contractor shall be fully responsible for maintenance of all items installed under this contract. Maintenance shall include, but not be limited to, any equipment failures or malfunctions as well as equipment damage either by the motoring public, Contractor operations, vandalism, or other means. The potential cost of replacing or repairing any malfunctioning, damaged, or vandalized equipment shall be included in the bid price of this item and will not be paid for separately.

### **Lighting System Maintenance Operations**

The Contractor's responsibility shall include all applicable responsibilities of the Electrical Maintenance Contract, State of Illinois, Department of Transportation, Division of Highways, District One. These responsibilities shall include the maintenance of lighting units (including sign lighting), cable runs and lighting controls. In the case of a pole knockdown or sign light damage, the Contractor shall promptly clear the lighting unit and circuit discontinuity and restore the system to service. The equipment shall then be re-set by the contractor within the time limits specified herein.

If the equipment damaged by normal vehicular traffic, not contractor operations, is beyond repair and cannot be re-set, the contractor shall replace the equipment in kind with payment made for such equipment under Article 109.04. If the equipment damaged by any construction operations, not normal vehicular traffic, is beyond repair and cannot be re-set, the contractor shall replace the equipment in kind and the cost of the equipment shall be included in the cost of this pay item and shall not be paid for separately.

Responsibilities shall also include weekly night-time patrol of the lighting system, with patrol reports filed immediately with the Engineer and with deficiencies corrected within 24 hours of the patrol. Patrol reports shall be presented on standard forms as designated by the Engineer. Uncorrected deficiencies may be designated by the Engineer as necessitating emergency repairs as described elsewhere herein.

The following chart lists the maximum response, service restoration, and permanent repair time the Contractor will be allowed to perform corrective action on specific lighting system equipment.

INCIDENT OR PROBLEM	SERVICE RESPONSE TIME	SERVICE RESTORATION TIME	PERMANENT REPAIR TIME
Control cabinet out	1 hour	4 hours	7 Calendar days
Hanging mast arm	1 hour to clear	na	7 Calendar days
Radio problem	1 hour	4 hours	7 Calendar days
Motorist caused damage or leaning light pole 10 degrees or more	1 hour to clear	4 hours	7 Calendar days
Circuit out – Needs to reset breaker	1 hour	4 hours	na
Circuit out – Cable trouble	1 hour	24 hours	21 Calendar days
Outage of 3 or more successive lights	1 hour	4 hours	na
Outage of 75% of lights on one tower	1 hour	4 hours	na
Outage of light nearest RR crossing approach, Islands and gores	1 hour	4 hours	na
Outage (single or multiple) found on night outage survey or reported to EMC	na	na	7 Calendar days
Navigation light outage	na	na	24 hours

- **Service Response Time** -- amount of time from the initial notification to the Contractor until a patrolman physically arrives at the location.
- **Service Restoration Time** – amount of time from the initial notification to the Contractor until the time the system is fully operational again (In cases of motorist caused damage the undamaged portions of the system are operational.)
- **Permanent Repair Time** – amount of time from initial notification to the Contractor until the time permanent repairs are made if the Contractor was required to make temporary repairs to meet the service restoration requirement.

Failure to provide this service will result in liquidated damages of \$500 per day per occurrence. In addition, the Department reserves the right to assign any work not completed within this timeframe to the Electrical Maintenance Contractor. All costs associated to repair this uncompleted work shall be the responsibility of the Contractor. Failure to pay these costs to the Electrical Maintenance Contractor within one month after the incident will result in additional liquidated damages of \$500 per month per occurrence. Unpaid bills will be deducted from any monies owed to the Contractor. Repeated failures and/or a gross failure of maintenance shall result in the State's Electrical Maintenance Contractor being directed to correct all deficiencies and the resulting costs deducted from any monies owed the contractor.

Damage caused by the Contractor's operations shall be repaired at no additional cost to the Contract.

### **Operation of Lighting**

The lighting shall be operational every night, dusk to dawn. Duplicate lighting systems (such as temporary lighting and proposed new lighting) shall not be operated simultaneously. Lighting systems shall not be kept in operation during long daytime periods.

Method of Measurement. The contractor shall demonstrate to the satisfaction of the Engineer that the lighting system is fully operational prior to submitting a pay request. Failure to do so will be grounds for denying the pay request. Months in which the lighting systems are not maintained and not operational will not be paid for. Payment shall not be made retroactively for months in which lighting systems were not operational.

Basis of Payment. Maintenance of lighting systems shall be paid for at the contract unit price per calendar month for MAINTENANCE OF LIGHTING SYSTEM, which shall include all work as described herein.

## **MAINTENANCE OF STREET LIGHTING SYSTEM (CITY OF CHICAGO)**

Description. This item consists of furnishing all labor, equipment, and incidental materials for maintaining existing street lighting and underpass lighting systems until the proposed new equipment is installed, energized, tested, and accepted for operation by the Commissioner.

The work must include any necessary temporary devices to maintain existing illumination. The location and protection devices necessary to comply with these requirements will be subject to the approval of the Commissioner.

Any temporary wire or cable which may be required to be installed overhead between existing poles, existing underpass luminaires, 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.

Materials. Materials must be according to the applicable Department of Electrical Operations (DEO) Specifications and Articles of Standard Specifications Section 1000 - Materials as noted elsewhere in these Specifications.

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

The Contractor shall MAINTENANCE OF STREET LIGHTING SYSTEM (CITY OF CHICAGO) (temporary and permanent) and proposed lighting systems, as well as receptacles and other ancillary devices connected to the applicable street or underpass lighting controllers. Effective the day the Contractor starts work, the Contractor must maintain the existing lighting equipment located within the project limits as it then exists.

Inspection of Electrical Systems: Add the following to Article 801.11 of the Standard Specifications:

"Maintenance Preconstruction Inspection:

General. Before performing any excavation, removal, or installation work (electrical or otherwise) at the site, the Contractor must request a maintenance preconstruction site inspection, to be held in the presence of the Commissioner and a representative of the party or parties responsible for maintenance of any lighting and/or traffic control systems which may be affected by the work. The request for the maintenance preconstruction inspection must be made no less than seven (7) calendar days prior to the desired inspection date. The maintenance preconstruction inspection shall:

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

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

Marking of Existing Cable Systems. The party responsible for maintenance of any existing lighting and/or traffic control systems at the project site will, at the Contractor's request, mark and/or stake, once per location, all underground cable routes owned or maintained by the City. A project may involve multiple "locations" where separated electrical systems are involved (i.e. different controllers). The markings shall be taken to have a horizontal tolerance of at least one (1) foot to either side. The request for the cable locations and marking shall be made at the same time the request for the maintenance preconstruction inspection is made. The Contractor must exercise extreme caution where existing buried cable runs are involved. The markings of existing systems are made strictly for assistance to the Contractor and this does not relieve the Contractor of responsibility for the repair or replacement of any cable run damaged in the course of his work, as specified elsewhere herein. NOTE THAT THE CONTRACTOR WILL BE ENTITLED TO ONLY ONE REQUEST FOR LOCATION MARKING OF EXISTING SYSTEMS AND THAT MULTIPLE REQUESTS MAY ONLY BE HONORED AT THE CONTRACTOR'S EXPENSE. NO LOCATES WILL BE MADE AFTER MAINTENANCE IS TRANSFERRED, UNLESS IT IS AT THE CONTRACTOR'S EXPENSE.

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

Damage to Electrical Systems. Delete the last paragraph of Article 801.06 of the Standard Specifications.

Lighting Operation and Maintenance Responsibility. The scope of work includes the assumption of responsibility for the continuing operation of existing, temporary or other lighting systems and all appurtenances 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 equipment installation 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 extent of the electrical equipment and systems to be maintained. Where there is existing lighting within the project limits, prior to the start of activities at the site, the Contractor must schedule a formal transfer of maintenance via the Commissioner, however failure to do so does not relieve the Contractor of the maintenance responsibility specified herein and such failure obligates the Contractor to correct deficiencies in the existing system at his own expense.

Effective the date the Contractor's activities (electrical or otherwise) at the job site begin, the Contractor will be responsible for the proper operation and maintenance of all existing lighting systems which may be affected by the work for which maintenance has been transferred to the Contractor and all temporary and newly constructed lighting systems under this Contract, until final acceptance or as otherwise determined by the Commissioner.

Except as specified herein, the Contractor's responsibility will include all applicable responsibilities of the City of Chicago, Department of Streets and Sanitation. These responsibilities will include lighting units (including underpass and navigational lighting), cable runs and lighting controls.

Electrical System Damage Response. The Contractor must respond to damage calls for all system components being maintained and/or installed by the Contractor, existing and proposed, including, but not limited to pole knockdowns, circuit outages, more than 3 luminaires on a circuit, 3 successive luminaires, and controller outages within one hour after notification and provide immediate corrective action. The Contractor must also repair other outages within 5 days. The Contractor must maintain in stock a sufficient amount of material and equipment to provide temporary and permanent repairs. Any damage to the lighting system from any cause whatsoever must be repaired or replaced in kind with equipment in the same condition before the incident or with new equipment provided by the Contractor at no additional cost to the Contract, all as approved by the Commissioner. If the Contractor fails to respond so as to produce immediate corrective action within the specified time frames, or fails to complete repairs in a timely manner the Commissioner may direct other forces, such as the City's Maintenance Contractor, to perform the work. Charges incurred will be direct billed to the Contractor. The City will retain all rights to pursue claims against third parties in all situations regardless of who is maintaining the system. The Contractor must also provide the City with all accident and damage reports from any incidents.

Weekly Night-time Patrols. Responsibilities must also include weekly night-time patrol of the lighting system, with patrol reports filed immediately with the Commissioner and with deficiencies corrected within 24 hours of the patrol. Patrol reports must be presented on standard forms as designated by the Commissioner. Uncorrected deficiencies may be designated by the Commissioner as necessitating emergency repairs as described elsewhere herein. Failure to submit patrol reports on a weekly basis will result in a Penalty for Non-Compliance as specified herein.

Contractor's Responsibility. Existing lighting systems which may be affected by the work will include, as a minimum, all existing lighting units within the project limits and these units may be temporarily isolated by means of in-line waterproof fuse holders as approved by the Commissioner. When a controller is to be replaced or modified under the Contract work, or where otherwise indicated, the controller and all systems connected to it must be included in the Contractor's responsibility for proper operation of lighting systems. The Contract Drawings may indicate the general extent of any existing lighting, but whether indicated or not, it remains the Contractor's responsibility to ascertain the extent of effort required for compliance with these specifications and failure to do so will not be justification for extra payment or reduced responsibilities.

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



Coordination Requirements for Existing and Temporary Lighting. The Contractor must coordinate maintenance of existing, temporary, and proposed lighting with the sequence of construction and maintenance of traffic for this Project.

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

The Contractor will 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 to a penalty 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 Specifications.

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 will be grounds for a penalty of \$500.00 for each and every occurrence, to be deducted from next pay estimate due Contractor.

Reimbursement. If the Contractor utilizes any lighting equipment owned by the City or uses existing ComEd service, the Contractor must compensate the City for such usage.

Method of Measurement. MAINTENANCE OF STREET LIGHTING SYSTEM (CITY OF CHICAGO) will not be measured for payment.

Basis of Payment. This work will be paid for at the contract lump sum price for MAINTENANCE OF STREET LIGHTING SYSTEM (CITY OF CHICAGO), which will be payment in full for: furnishing and installing all temporary lighting units; maintaining existing, temporary, and proposed lighting systems; and aerial cable and ancillary equipment required to maintain the existing lighting system as described herein.

## **ELECTRICAL WORK FOR CANOPY LIGHTING AND HEAT TRACE (CTA)**

Description. This item consists of providing all labor and materials required for installing a heat trace system for protecting downspouts, pipes, drains and gutters from freezing on a CTA pedestrian canopy structure and a canopy lighting system to illuminate the CTA pedestrian canopy structure as specified herein, as shown on the Plans and as directed by the Engineer.

All materials and work must comply with the CTA Master Specifications.

Materials and Installation. The materials and installation of the heat trace system shall be as described in CTA MASTER SPECIFICATION SECTION 23 83 30 – ELECTRIC HEAT TRACING SYSTEMS. The Contractor shall provide all the labor and materials necessary for a complete and functional heat trace system including all wiring, controls, thermostats, electrical connections, conduit, cable, boxes, outlets, and other equipment and accessories required.

The installation of the canopy lighting system shall be as described in CTA MASTER SPECIFICATION SECTION 26 50 10 – LIGHTING FIXTURES. The Contractor shall provide all the labor and materials necessary for a complete and functional canopy lighting system including all wiring, controls, circuit breakers, mounting brackets, electrical splices and connections, conduit, cable, boxes, outlets, and other equipment and accessories required.

Method of Measurement. ELECTRICAL WORK FOR CANOPY LIGHTING AND HEAT TRACE (CTA) will not be measured for payment.

Basis of Payment. This work will be paid for at the contract lump sum price for ELECTRICAL WORK FOR CANOPY LIGHTING AND HEAT TRACE (CTA), which will be payment in full for: furnishing and installing all work required for a complete heat trace system including conduits, wires, control panels, sensors systems.

The LED light source fixtures for the canopy lighting the canopy lighting will not be included in this pay item and will be paid for separately under another pay item.

## **LED LIGHT SOURCE FIXTURE FOR CANOPY LIGHTING (CTA)**

Description. This item shall consist of furnishing and installing an LED fixture on the CTA pedestrian canopy structure as specified herein, as shown on the Plans and as directed by the Engineer. All mounting brackets and accessories required to mount the fixture to the canopy structure will be included in this pay item.

All materials and work must comply with the CTA Master Specifications.

Materials and Installation. The LED light source fixture shall be provided and installed be as described in CTA MASTER SPECIFICATION SECTION 26 50 10 – LIGHTING FIXTURES. The Contractor shall provide all the labor and materials necessary to completely install the fixture on the CTA pedestrian canopy structure.

Method of Measurement. Luminaires shall be counted, each.

Basis of Payment. This item shall be paid at the contract unit price each for LED LIGHT SOURCE FIXTURE FOR CANOPY LIGHTING (CTA), which shall be payment in full for the material and work described herein.

## **EXPOSED RACEWAYS**

Effective: January 1, 2012

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

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

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

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

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

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

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

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

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

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

- c. The exterior and interior galvanized conduit surface shall be chemically treated to enhance PVC coating adhesion and shall also be coated with a primer before the PVC coating to ensure a bond between the zinc substrate and the PVC coating. The bond strength created shall be greater than the tensile strength of the plastic coating.
- d. The nominal thickness of the PVC coating shall be 1 mm (40 mils). The PVC exterior and urethane interior coatings applied to the conduit shall afford sufficient flexibility to permit field bending without cracking or flaking at temperatures above -1°C (30°F).
- e. An interior urethane coating shall be uniformly and consistently applied to the interior of all conduit and fittings. This internal coating shall be a nominal 2 mil thickness. The interior coating shall be applied in a manner so there are no runs, drips, or pinholes at any point. The coating shall not peel, flake, or chip off after a cut is made in the conduit or a scratch is made in the coating.
- f. Conduit bodies shall have a tongue-in-groove gasket for maximum sealing capability. The design shall incorporate a positive placement feature to assure proper installation. Certified test results confirming seal performance at 15 psig (positive) and 25 in. of mercury (vacuum) for 72 hours shall be submitted for review when requested by the Engineer.
- g. The PVC conduit shall pass the following tests:

Exterior PVC Bond test RN1:

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

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

Boil Test:

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

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

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

Heat/Humidity Test:

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

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

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

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

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

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

“Expansion fittings and LFNC will not be measured for payment.”

Revise Article 811.05 of the Standard Specifications to read:

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

## **UNDERGROUND RACEWAYS**

Effective: January 1, 2012

Revise Article 810.04 of the Standard Specifications to read:

“Installation. All underground conduit shall have a minimum depth of 30-inches (700 mm) below the finished grade.”

Add the following to Article 810.04 of the Standard Specifications:

“All metal conduit installed underground shall be Rigid Steel Conduit unless otherwise indicated on the plans.”

Add the following to Article 810.04 of the Standard Specifications:

“All raceways which extend outside of a structure or duct bank but are not terminated in a cabinet, junction box, pull box, handhole, post, pole, or pedestal shall extend a minimum of 300 mm (12”) or the length shown on the plans beyond the structure or duct bank. The end of this extension shall be capped and sealed with a cap designed for the conduit to be capped. The ends of rigid metal conduit to be capped shall be threaded, the threads protected with full galvanizing, and capped with a threaded galvanized steel cap. The ends of rigid nonmetallic conduit and coilable nonmetallic conduit shall be capped with a rigid PVC cap of not less than 3 mm (0.125”) thick. The cap shall be sealed to the conduit using a room-temperature-vulcanizing (RTV) sealant compatible with the material of both the cap and the conduit. A washer or similar metal ring shall be glued to the inside center of the cap with epoxy, and the pull cord shall be tied to this ring.”

Add the following to Article 810.04(c) of the Standard Specifications:

“Coilable non-metallic conduit shall be machine straightened to remove the longitudinal curvature caused by coiling the conduit onto reels prior to installing in trench, encasing in concrete or embedding in structure. The straightening shall not deform the cross-section of the conduit such that any two measured outside diameters, each from any location and at any orientation around the longitudinal axis along the conduit differ by more than 6 mm (0.25”).” The longitudinal axis of the straightened conduit shall not deviate by more than 20 mm per meter (0.25” per foot” from a straight line. The HDPE and straightening mechanism manufacturer operating temperatures shall be followed.

#### **UNIT DUCT**

Effective: January 1, 2012

Revise the first paragraph of Article 810.04 to read:

“The unit duct shall be installed at a minimum depth of 30-inches (760 mm) unless otherwise directed by the Engineer.”

Revise Article 1088.01(c) to read:

“(c) Coilable Nonmetallic Conduit.

General:

The duct shall be a plastic duct which is intended for underground use and which can be manufactured and coiled or reeled in continuous transportable lengths and uncoiled for further processing and/or installation without adversely affecting its properties of performance. The duct shall be a plastic duct which is intended for underground use and can be manufactured and coiled or reeled in continuous transportable lengths and uncoiled for further processing and/or installation without adversely affecting its properties of performance.

The duct shall be made of high density polyethylene which shall meet the requirements of ASTM D 2447, for schedule 40. The duct shall be composed of black high density polyethylene meeting the requirements of ASTM D 3350, Class C, Grade P33. The wall thickness shall be in accordance with Table 2 for ASTM D 2447.

The duct shall be UL Listed per 651-B for continuous length HDPE coiled conduit. The duct shall also comply with NEC Article 354.100 and 354.120.

Submittal information shall demonstrate compliance with the details of these requirements.

Dimensions:

Duct dimensions shall conform to the standards listed in ASTM D2447. Submittal information shall demonstrate compliance with these requirements.

Nominal Size		Nominal I.D.		Nominal O.D.		Minimum Wall	
mm	in	mm	in	mm	in	mm	in
31.75	1.25	35.05	1.380	42.16	1.660	3.556 +0.51	0.140 +0.020
38.1	1.50	40.89	1.610	48.26	1.900	3.683 +0.51	0.145 +0.020

Nominal Size		Pulled Tensile	
mm	in	N	lbs
31.75	1.25	3322	747
38.1	1.50	3972	893

**Marking:**

As specified in NEMA Standard Publication No. TC-7, the duct shall be clearly and durably marked at least every 3.05 meters (10 feet) with the material designation (HDPE for high density polyethylene), nominal size of the duct and the name and/or trademark of the manufacturer.

**Performance Tests:**

Polyethylene Duct testing procedures and test results shall meet the requirements of UL 651. Certified copies of the test report shall be submitted to the Engineer prior to the installation of the duct. Duct crush test results shall meet or exceed the following requirements:

Duct Diameter		Min. force required to deform sample 50%	
mm	in	N	lbs
35	1.25	4937	1110
41	1.5	4559	1025



**WIRE AND CABLE**

Effective: January 1, 2012

Add the following to the first paragraph of Article 1066.02(a):

“The cable shall be rated at a minimum of 90°C dry and 75°C wet and shall be suitable for installation in wet and dry locations, and shall be resistant to oils and chemicals.”

Revise the Aerial Electric Cable Properties table of Article 1066.03(a)(3) to read:

Aerial Electric Cable Properties

Phase Conductor		Messenger wire			
Size AWG	Stranding	Average Insulation Thickness		Minimum Size AWG	Stranding
		mm	mils		
6	7	1.1	(45)	6	6/1
4	7	1.1	(45)	4	6/1
2	7	1.1	(45)	2	6/1
1/0	19	1.5	(60)	1/0	6/1
2/0	19	1.5	(60)	2/0	6/1
3/0	19	1.5	(60)	3/0	6/1
4/0	19	1.5	(60)	4/0	6/1

Add the following to Article 1066.03(b) of the Standard Specifications:

“Cable sized No. 2 AWG and smaller shall be U.L. listed Type RHH/RHW and may be Type RHH/RHW/USE. Cable sized larger than No. 2 AWG shall be U.L. listed Type RHH/RHW/USE.”

Revise Article 1066.04 to read:

“Aerial Cable Assembly. The aerial cable shall be an assembly of insulated aluminum conductors according to Section 1066.02 and 1066.03. Unless otherwise indicated, the cable assembly shall be composed of three insulated conductors and a steel reinforced bare aluminum conductor (ACSR) to be used as the ground conductor. Unless otherwise indicated, the code word designation of this cable assembly is “Palomino”. The steel reinforced aluminum conductor shall conform to ASTM B-232. The cable shall be assembled according to ANSI/ICEA S-76-474.”

Revise the second paragraph of Article 1066.05 to read:

“The tape shall have reinforced metallic detection capabilities consisting of a woven reinforced polyethylene tape with a metallic core or backing.”

**INSTALL LIGHT POLE, MAST ARM AND LUMINAIRE (CHICAGO)**

(Material Provided by City of Chicago)

Description. This work will consist of the retrieving from the City of Chicago storage and installing a metal light pole, mast arm(s), luminaire(s), ballast housing (if required), additional mid-mount luminaire(s) and brackets on the pole (if required) and all associated hardware and appurtenances provided by the City of Chicago on a concrete foundation, as specified herein, and as shown on the plans, and as directed by the Commissioner.

For Chicago 2000 Gateway Poles the work shall include an ornamental fluted steel pole (Standard Drawings 930, 930B and 930C), 8-foot ornamental arm with supporting scroll (Standard Drawing 930), the pole base (Standard Drawing 930A), pendant luminaire (Standard Drawing 931), finial (Standard Drawings 930 and 930C) and the following components detailed in Standard Drawings 930 and 930B; the hand hole door, the rosettes, the hanging basket collar, banner arms and bracelets.

It shall be the responsibility of the Contractor to transport the light pole, mast arm(s), luminaire(s), ballast housing and all associated hardware and appurtenances from the City storage site to the job site.

Inspection and Acceptance. The Contractor shall examine the metal light pole, mast arm, luminaires, ballast housing, pole base and all associated components required for a complete installation provided by the City in the presence of the Engineer. After accepting the lighting equipment, the Contractor shall be held responsible for the preservation of the condition of the lighting unit, as it was at the time of acceptance, until the Final Acceptance Inspection.

Transportation. The Contractor shall transport, handle and store (as applicable) the lighting equipment in complete conformance with the manufacturer's recommendations. The Contractor shall make arrangements to transfer the street lighting equipment from the City of Chicago's storage facility located at 4100 South Cicero Avenue, Chicago, IL to the job site. This shall be done on weekdays between the hours of 8:00 a.m. and 4:00 p.m., excluding City holidays. Forty-eight hours advance notice is necessary before pickup of the street lighting equipment.

Installation. Installation shall be as described in Articles 821, 830 and 877.

Method of Measurement. The lighting unit shall be counted as each installed.

Basis of Payment. This item shall be paid for at the contract unit per INSTALL LIGHT POLE, MAST ARM AND LUMINAIRE (CHICAGO), which shall be payment in full for the installation.

## **REMOVE EXISTING MAST ARM AND LUMINAIRE (CDOT)**

Description. This work will consist of the removing an existing street lighting mast arm and luminaire from a traffic signal pole at the locations shown on the Plans, or as directed by the Commissioner.

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

Removal of City of Chicago Mast Arm, Salvage. Where indicated, mast arms, luminaires and all associated hardware and appurtenances shall remain the property of the City of Chicago and shall be delivered back to the City. City of Chicago salvaged lighting units must be delivered to the City storage yard located at 4100 South Cicero Avenue, Chicago, IL or to another City of Chicago locations as directed by the Engineer.

The street lighting cable must be removed or reconnected as required back to the last unaffected source as directed by the Department of Electrical Operations (DEO) field representative. Removed cable will become the property of the Contractor, and must be disposed of outside the right of way by the Contractor. Cable removal, or reconnection, including any required temporary splices, will not be paid for separately but will be included in this item at no additional expense.

No removal work shall be permitted without approval from the Engineer. Existing mast arms and luminaires to be removed must be disassembled as required for the complete and safe removal with care to prevent damage. Removal will include all incidental work and items associated with the equipment as directed by the Commissioner.

Any damage resulting from the removal of the mast arm, luminaire and associated hardware, shall be repaired or replaced in kind. The Engineer will be the sole judge to determine the extent of damage and the suitability of repair and/or replacement.

Transportation. The Contractor shall crate and transport the mast arm and luminaire in complete conformance with the manufacturer's recommendations. The Contractor shall make arrangements to transfer the street lighting equipment to the City of Chicago's storage facility located at 4100 South Cicero Avenue, Chicago, IL. This shall be done on weekdays between the hours of 8:00 a.m. and 4:00 p.m., excluding City holidays. Forty-eight hours advance notice is necessary before drop off of street lighting equipment.

The reflector and lens of the existing luminaire shall be cleaned and a new lamp installed in the existing luminaire prior to installation. This work will not be paid for separately but will be included in this item at no additional expense. The new lamp must be in accordance with Article 1067.06 of the Standard Specifications.

Any damage sustained to the mast arm and luminaire during the removal, storage and reinstallation operations shall be repaired, or replaced in kind, to the satisfaction of the Engineer at no additional cost.

Method of Measurement. This work will be measured per each combined set of mast arm and luminaire removed from a traffic signal pole.

Basis of Payment. This work will be paid for at the Contract Unit Price for each REMOVE AND REINSTALL EXISTING MAST AND LUMINAIRE (CDOT), which price will be payment in full for all labor, equipment, materials and incidental work necessary to complete the work as specified.

**INSTALL MAST ARM AND LUMINAIRE (CHICAGO)**  
(Material Provided by City of Chicago)

Description. This work will consist of the retrieving from the City of Chicago storage and installing a mast arm, luminaire and all associated hardware and appurtenances provided by the City of Chicago on a traffic signal pole, as specified herein, and as shown on the plans, and as directed by the Engineer.

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

It shall be the responsibility of the Contractor to transport the mast arm, luminaire and all associated hardware and appurtenances from the City storage site to the job site.

Inspection and Acceptance. The Contractor shall examine the mast arm and luminaire in the presence of the Engineer. After accepting the lighting equipment, the Contractor shall be held responsible for the preservation of the condition of the equipment, as it was at the time of acceptance, until the Final Acceptance Inspection.

Transportation. The Contractor shall transport, handle and store (as applicable) the mast arm, luminaire, all associated hardware and appurtenances in complete conformance with the manufacturer's recommendations. The Contractor shall make arrangements to transfer the street lighting equipment from the City of Chicago's storage facility located at 4100 South Cicero Avenue, Chicago, IL to the job site. This shall be done on weekdays between the hours of 8:00 a.m. and 4:00 p.m., excluding City holidays. Forty-eight hours advance notice is necessary before pickup of the street lighting equipment.

Installation. Installation shall be as described in Articles 821 and 877.

The mast arm and luminaire shall be installed on a traffic signal pole. The contractor shall replace the existing pole wire at no additional cost.

When a conduit or duct extension is required, the conduit and/or duct may be spiced and a new span of cable installed. The Engineer will inspect all conduit/duct splices before backfilling.

The mast arm and luminaire may be removed and reinstalled as a unit, at the option of the Contractor, with approval from the Engineer. No additional compensation will be paid for these operations.

Any damage sustained to the mast arm and luminaire during the removal, storage and reinstallation operations shall be repaired, or replaced in kind, to the satisfaction of the Engineer at no additional cost.

Method of Measurement. This work will be measured per each combined set of mast arm and luminaire installed on a traffic signal pole.

Basis of Payment. This work will be paid for at the Contract Unit Price for each REMOVE AND REINSTALL EXISTING MAST AND LUMINAIRE (CDOT), which price will be payment in full for all labor, equipment, materials and incidental work necessary to complete the work as specified.

**TEMPORARY WOOD POLE, 60 FT., CLASS 4**

Description. This item shall consist of furnishing and installing a temporary wood pole, as specified herein and all hardware and accessories required for the intended temporary use of the pole.

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

Item	Article/Section
(a) Wood Pole.....	1069.04

**CONSTRUCTION REQUIREMENTS**

Installation. Installation shall be as described in Article 830.03(c). The Contractor shall provide all hardware to install the pole as specified herein and indicated on the Plans.

Wood poles may be used poles as approved by the Engineer as described in Article 830.04. The wood pole, as applicable, shall remain the property of the Contractor and shall be removed when directed by the Engineer.

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

Basis Of Payment. This item shall be paid at the contract unit price each for TEMPORARY WOOD POLE, of the class and length indicated.

### **RACKING CABLES IN MANHOLE OR HANDHOLE (CDOT)**

Description. This item consists of providing labor and materials for racking of fiber optic cable in split innerduct and/or traffic signal and lighting copper cable around the inside perimeter of a manhole, in conformance with the Plans. In each manhole, the Contractor shall furnish and install at least four support brackets attached to the manhole walls, on which neatly coiled fiber optic cable in split innerduct and copper cable can be secured. The support brackets shall be attached firmly by screws drilled into the wall. Specific racking layout and components shall be provided in a submittal to the Engineer for each manhole, for review and approval in advance of installation.

In the event that a cable enclosure or other protective treatment of cable is used in place of racking on brackets at the direction of the Engineer, such alternate treatment shall be considered incidental to this pay item.

Method of Measurement. This Work will be measured on a per each basis each for manhole or handhole racked.

Basis of Payment. This Work will be paid for at the Contract Unit Price each per RACKING CABLES IN MANHOLE OR HANDHOLE (CDOT), which will be payment in full for the material and work described herein.

### **DRILL MANHOLE OR HANDHOLE, CHICAGO**

Description. This work will consist of drilling a hole in an existing handhole or manhole for the installation of a new conduit. This item must meet the requirements of Article 879 of the Standard Specifications.

Construction. The size of the hole must be as close as possible to the size of the conduit to be installed. The conduit must be installed in the drilled hole with a bushing before the hole is grouted. The conduit will be covered by a separate item. The space between the conduit and the handhole or manhole wall must be caulked with a waterproof grout. Drawing 814 provides additional information.

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

Basis of Payment. This work will be paid for at the contract unit price each for DRILL MANHOLE OR HANDHOLE, CHICAGO, which price will be payment in full for drilling the hole, grouting, and any additional work required to accomplish this task.

## REMOVAL OF LIGHTING UNIT, SALVAGE

Add the following to Article 842.03(b) of the Standard Specifications:

Removal of City of Chicago Lighting Unit, Salvage. Where indicated, poles, mast arms, luminaires, ballast housing and all associated hardware and appurtenances shall remain the property of the City of Chicago and shall be delivered back to the City. City of Chicago salvaged lighting units must be delivered to the City storage yard located at 4100 South Cicero Avenue, Chicago, IL or to another City of Chicago locations as directed by the Engineer.

Transportation. The Contractor shall crate and transport the light pole, mast arm, luminaire and ballast housing in complete conformance with the manufacturer's recommendations. The Contractor shall make arrangements to transfer the street lighting equipment to the City of Chicago's storage facility located at 4100 South Cicero Avenue, Chicago, IL. This shall be done on weekdays between the hours of 8:00 a.m. and 4:00 p.m., excluding City holidays. Forty-eight hours advance notice is necessary before drop off of street lighting equipment.

## GROUND ROD, 3/4" DIA. X 10.0'-0" LENGTH (CDOT)

Description. This item consists of furnishing, installing, and connecting ground rods for the grounding of service neutral conductors and for supplementing the equipment grounding system via connections at lighting units, manholes, handholes, street lighting controllers, underpass lighting controllers, and traffic signal controllers throughout the system. All materials and Work must be in accordance with Article 250 of the NEC.

Materials. Materials must be according to the following Department of Electrical Operations (DEO) Specifications and Articles of Standard Specifications Section 1000 - Materials:

### Item Requirement

- |                             |  |
|-----------------------------|--|
| (a) Copper Ground Wire..... | DEO Specification No. 1440   |
| (b) Ground Rod.....         | DEO Specification No. 1465 and<br>Standard Specifications, Article 1087.01 |

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

Installation. Ground rods must be driven so that the tops of the rod are 24 inches below finished grade, unless noted otherwise on the Contract Drawings. Where indicated, ground rods must be installed through concrete foundations or manholes. Where ground conditions, such as rock, preclude the installation of the ground rod, the ground rod may be deleted with the prior approval of the Commissioner.

Ground rod connection must be made by approved clamps. Ground wire for connection to foundation steel, or as otherwise indicated, must be stranded uncoated bare copper, in accordance with the applicable requirements of ASTM Designation B-3 and ASTM Designation B-8 and must be included in this item. Unless otherwise indicated, the wire must not be less than No. 8 AWG.

The ground wire must be interconnected to the ground rod, reinforcing steel and anchor bolts at each foundation. All connections to ground rods, structural steel and anchor bolts must be made with approved clamp. Where such connections are made to insulated conductors, the connection must be wrapped with at least 4 layers of electrical tape extended 6 inches onto the conductor insulation.

Method of Measurement. Ground rods will not be paid for separately. Ground wires and connection of ground rods at lighting units, manholes, handholes, controller foundations, and wall mounted controllers will be included in this pay item.

Basis of Payment. This work will not be paid for separately but shall be included in the items requiring ground rods.

### **CABLE IN CONDUIT, TRIPLEX 2-1/C NO. 6 AND 1-1/C NO. 8 GROUND**

Description. This work will consist of furnishing and installing electric cable that is triplexed. The cable must be rated at 600 volts and must consist of two number 6 conductors and one number 8 conductor. The cable will be installed in conduit underground.

Material. The cable must meet all requirements of Material Specification 1534 of the Bureau of Electricity, City of Chicago.

Construction Method. All cables must be installed with care to prevent damage to the cable. Any defects found in the cable must be reported to the Engineer. Damaged cable must be replaced.

The cable must be pulled into the conduit with a minimum of dragging on the ground or pavement. This will be accomplished by means of reels mounted on jacks or other suitable devices located for unreeling cable directly into duct. Lubricants must be used to facilitate installation if deemed necessary by the Contractor.

Bends in the cable will conform to the recommended minimum radii as outlined in the National Electric Code.

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

Where cable runs continue from manhole to manhole without tapping within a light pole, they will be continuous without splices unless authorized by the Engineer.

The cable installation must be color coded so that each lead of all circuits may be easily identified and lighting units connected to the proper leg as indicated on the Plans. The equipment grounding conductor (no. 8) must be color coded green.



All wire or cable in the distribution panels and control cabinets must be properly trained and have sufficient slack provided for any rearrangement of equipment or future additions.

There must be at least three feet of slack in a street light pole base or street light controller base. A handhole must have at least five feet of slack and a manhole at least ten feet of slack.

**Method of Measurement.** The length of triplex cable furnished and installed will be measured as the length of conduit plus three feet for cable entering and leaving a light pole or street light control cabinet, plus any slack in manholes or handholes.

**Basis of Payment.** This work shall be paid for at the contract unit price per lineal foot for 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, and incidentals necessary to complete the work as per the Plans.

### **ELECTRIC CABLE AERIAL SUSPENDED, COMMUNICATION, NO. 19 100 PAIR**

**Description.** This work will consist of furnishing and installing a 100 pair, Number 19 AWG copper electric communication cable in conduit and aerially suspended on temporary wood poles as specified herein, as shown on the Plans and as directed by the Engineer.

All work must be coordinated and comply with the City of Chicago Office of Emergency Management and Communications requirements.

All splices will be performed by the City of Chicago Office of Emergency Management and Communications personnel.

**Material.** The 100-pair, 19 AWG copper communication cable will be the BELL System Type BHBH as manufactured by GENERAL CABLE, Air Core Bonded PASP, Catalog Number 7502214 or approved equal.

The cable shall comply with Telcordia (Bellcore) Specification GR-421-CORE and be ROHS Compliant (effective 1/1/10).

**Cable Installation.** The communication cables shall be installed in continuous runs in conduit, between wood poles and in manholes as shown on the Plans.

Cable pulling apparatus shall have no sharp edges or protrusions which could damage the cables or raceways. The cable must be directly installed from the cable reels on which the cable was shipped. Dragging or laying cable on the ground or pavement will not be permitted. This will be accomplished by means of reels mounted on jacks or other suitable devices located for unreeling cable directly into the duct.

Immediately after placement, the cable ends shall be sealed to prevent entrance of moisture and contaminants, unless splicing or termination work is performed concurrently.

Wire and cable shall not be bent to a radius less than the manufacturer's recommended bending radius, either in temporary/permanent placement or during installation.

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 the existing racks are in poor condition, the Contractor must install new racks. The rack must be approved by the Engineer prior to installation. Any material and labor involved in training and racking the cable and the cost of providing a new rack will be considered incidental to the cost of this pay item.

There must be at least 25 feet of slack cable provided on each temporary wood pole. A hand hole must have at least five feet of slack and a manhole at least ten feet of slack.

Installation on Aerial Spans. Communication cables installed aerially without messenger wires shall be secured to the wood poles with a tether wire, clamp and associated hardware as directed by the Engineer and the OEMC. The tether wire shall comply with Article 1076.03 of the Standard Specifications.

Cable Placement into Conduit Risers. Kellum grips and/or other hanger devices shall be used to support the vertical drop of cable and to prevent any possible kinking of the cable after installation. The top of the risers shall have a hex nut type watertight service entrance connector with an oval shaped grommet. The grommet shall be either neoprene or rubber. The voids between the cable(s) and the grommet shall be sealed with silicone.

100 pair, No. 19 AWG electric communication cable installed in conduit risers and in underground conduit as shown on the Plans will be included for measurement and payment under this pay item.

Method of Measurement. Cable will be measured for payment in feet in place. Cable will be measured horizontally and vertically between the changes in direction, including the cable in the vertical conduit riser and any extra slack cable as specified herein.

Basis of Payment. This work shall be paid for at the contract unit price per foot for ELECTRIC CABLE AERIAL SUSPENDED, COMMUNICATION, NO. 19 100 PAIR as specified. The price will be payment in full for furnishing, installing, and testing the cable, and will include all mounting hardware, brackets, tether wire, material, labor and incidentals necessary for a complete installation of the work per the Plans.

**CONCRETE FOUNDATION, 24" DIAMETER, 1 1/4" ANCHOR RODS, 15" BOLT CIRCLE, 7 FEET (CDOT)**

**CONCRETE FOUNDATION, 28" DIAMETER, 1 1/4" ANCHOR RODS, 15" BOLT CIRCLE, 7 FEET (CDOT)**

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

Material. Concrete must be Portland cement concrete meeting the requirements of Article 1020 of the Standard Specifications for SI Class concrete. Reinforcement bars must meet the requirements of Section 1006.10 of the Standard Specifications. Anchor rods must meet the requirements of Material Specification 1467 and the ground rod must meet the requirements of Material Specification 1465. Conduit elbows must be PVC conduit meeting the requirements of Material Specification 1533.

Construction. Every foundation will be installed at the location designated and in the manner herein specified or in special cases as specifically directed. The contractor will locate foundations as per plan or as directed by the Resident Engineer. A hole must be augered for placement of the concrete form.

CONCRETE FOUNDATION, 24" DIAMETER, 1 1/4" ANCHOR RODS, 15" BOLT CIRCLE, 7 FEET (CDOT) is a foundation for arterial street light pole; either steel or aluminum, conventional or davit (Standard Drawing 818).

CONCRETE FOUNDATION, 28" DIAMETER, 1 1/4" ANCHOR RODS, 15" BOLT CIRCLE (CDOT) is a foundation for a Chicago 2000 Gateway and Pedestrian ornamental light pole (Standard Drawing 953).

Top surface of these foundations in parkway will be at an elevation of two inches (2") above grade or as required by the Engineer. Care must be taken to install a level foundation and to ensure adequate anchor rod projections for double nut installation. The foundations must be centered back from the face of the curb in accordance with dimensions shown on the construction plans. Foundation raceways must consist of large radius conduit elbow(s) in quantity, size and type as specified on the corresponding standard drawing or in the construction plans. Any number of elbows in excess of the number shown on the standard drawing must be paid for under a separate pay item. The elbow ends above ground will be capped with standard conduit bushings. The Contractor must furnish anchor rods, a ground rod, hardware, conduit elbow(s) and all other material shown on applicable foundation construction drawings. Depth of foundation will be as shown on the appropriate drawing. The foundation top must be chamfered 3/4 of an inch. When the foundation is installed in a sidewalk, the foundation must be installed level, with the height of the foundation as close to the height of the sidewalk as possible, or as directed by the Engineer. A proper expansion joint will be installed between the sidewalk and the foundation.

Anchor rods must be set in accordance with applicable construction plans so that when poles are mounted on the foundations, the street lighting mast arm will be properly oriented as indicated on the construction plans. The anchor rods will be set by means of a metal template which shall be submitted for approval before any foundation work is begun. The template must hold the rods vertical, and in proper position. Anchor rods must conform in all respects to the appropriate drawing.

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

Basis of Payment. Payment will be made for foundations installed in place, including elbows, in accordance with construction drawings, constructions plans and these specifications. All necessary excavation and restoration of pavement, sidewalk and fill to their original conditions will be included in the unit price. This work will be paid for at the contract unit price per each for CONCRETE FOUNDATION of the diameter and size specified.

## **CDOT TRAFFIC SIGNAL SPECIFICATIONS**

The specifications included in this section are for Chicago Department of Transportation (CDOT) traffic signal items of work. These will include all pay items used for work on plan sheets for CDOT Traffic Signals. The Material Specifications referred to within these specifications refer to CDOT Material Specifications which can be found in the CDOT Material Specifications section of the Contract Specifications. The Standard Drawings referred to within these specifications refer to the CDOT Standard Specification Drawings which can be found in the Contract Plans.

## **TEMPORARY TRAFFIC SIGNAL INSTALLATION**

Revise Section 890 of the Standard Specifications to read:

Description. This work shall consist of furnishing, installing, maintaining, and removing a temporary traffic signal installation as shown on the plans and as directed by CDOT. This work will include, but is not limited to wood poles, temporary signal controller and cabinet, temporary signal heads, and signing to maintain visibility and continuous traffic signal operation during construction.

### General.

Only an approved equipment vendor will be allowed to assemble the temporary traffic signal cabinet. A representative of the approved control equipment vendor shall be present at the temporary traffic signal turn-on inspection. All material and equipment the Contractor proposes to use in the Temporary Traffic Signal Installation shall comply with the Chicago Department of Transportation, Division of Electrical Operations (DEO) material and equipment standards and standard drawings included in the contract. The Contractor shall submit a list of material and equipment he/she proposes to use for the temporary signal installation(s) to the Engineer for approval prior to beginning work.

Construction Requirements.

- (a) Controllers. Only control equipment, including controller, controller cabinet, and peripheral equipment, supplied by one of CDOT's approved equipment manufacturers will be approved for use at temporary traffic signal locations. All control equipment for the temporary traffic signal(s) shall be furnished by the Contractor unless otherwise stated in the plans. On projects with multiple temporary traffic signal installations, all controllers shall be the same manufacturer brand and model number with current software installed.
- (b) Cabinets. All temporary traffic signal cabinets shall have a closed bottom made of aluminum alloy. The bottom shall be sealed along the entire perimeter of the cabinet base to ensure a water, dust and insect-proof seal. The bottom shall provide a minimum of two (2) 4 inch (100 mm) diameter holes to run the electric cables through. The 4 inch (100 mm) diameter holes shall have a bushing installed to protect the electric cables and shall be sealed after the electric cables are installed.
- (c) Grounding. Grounding shall be provided for the temporary traffic signal cabinet meeting or exceeding the applicable portions of the National Electrical Code, Section 806 of the Standard Specifications and shall meet the requirements of the District 1 Traffic Signal Specifications for "Grounding of Traffic Signal Systems."
- (d) Traffic Signal Heads. All traffic signal sections and pedestrian signal sections shall be 12 inches (300 mm). Traffic signal sections shall be LED with expandable view, unless otherwise approved by the Engineer. Pedestrian signal heads shall be Light Emitting Diode (LED) Pedestrian Countdown Signal Heads. The temporary traffic signal heads shall be placed as indicated on the temporary traffic signal plan or as directed by the Engineer. The Contractor shall furnish enough extra cable length to relocate heads to any position on the span wire or at locations illustrated on the plans for construction staging. The temporary traffic signal shall remain in operation during all signal head relocations. Each temporary traffic signal head shall have its own cable from the controller cabinet to the signal head.
- (e) Signs. All existing street name and intersection regulatory signs shall be removed from existing poles and relocated to the temporary signal span wire. If new mast arm assembly and pole(s) and posts are specified for the permanent signals, the signs shall be relocated to the new equipment at no extra cost. Any intersection regulatory signs that are required for the temporary traffic signal shall be provided as shown on the plans or as directed by the Engineer. Relocation, removing, bagging and installing the regulatory signs for the various construction stages shall be provided as shown on the plans or as directed by the Engineer.

- (f) Maintenance. Maintenance shall meet the requirements of the Standard Specifications and MAINTENANCE OF EXISTING TRAFFIC SIGNAL INSTALLATION in Division 800 of these specifications. Maintenance of temporary signals and of the existing signals shall be included in the cost of the TEMPORARY TRAFFIC SIGNAL INSTALLATION pay item. When temporary traffic signals are to be installed at locations where existing signals are presently operating, the Contractor shall be fully responsible for the maintenance of the existing signal installation as soon as he begins any physical work on the Contract or any portion thereof. In addition, a minimum of seven (7) days prior to assuming maintenance of the existing traffic signal installation(s) under this Contract, the Contractor shall request that the Resident Engineer contact CDOT for an inspection of the installation(s).

Basis of Payment. This work shall be paid for at the contract unit price each for TEMPORARY TRAFFIC SIGNAL INSTALLATION the price of which shall include all costs for the modifications required for traffic staging, changes in signal phasing as required in the Contract plans, all material required, the installation and complete removal of the temporary traffic signal. Each intersection will be paid for separately.

#### **MAINTENANCE OF EXISTING TRAFFIC SIGNAL INSTALLATION**

Description. This work will consist of maintaining an existing traffic signal installation that has been designated to remain in operation during construction of the new traffic signals. If during the course of construction it becomes necessary to use temporary aerial cable to keep the intersection functioning, this work will be performed at no additional cost. However, the need for temporary traffic signals and controllers will be paid for under separate items, as shown on the plans or as directed by the Engineer.

Maintenance Procedures. Before taking over maintenance of the existing traffic signal installation, the Contractor must arrange to make an inspection with the Engineer to determine if any corrective action needs to be done, and to mutually agree on a date for transferring maintenance. The contractor should normally begin maintaining the existing traffic signals as soon as he begins any work at the site.

The contractor will be responsible for maintaining the traffic signal installation in proper operating condition. The contractor must perform the maintenance procedures as outlined in Section 802.07 of the Standard Specifications.

The traffic controller must be maintained as outlined in Section 850.03 of the Standard Specifications.

Method of Measurement. This work will be measured per each intersection. The time frame will begin at the mutually agreed date for taking over maintenance. The time frame will end upon the issuance of a Signal Acceptance Notice from the Engineer. Before such notice is given, a final inspection must be performed with the contractor, the Engineer, and a representative from the Chicago Department of Transportation.

Basis of Payment. This work will be paid for at the contract unit price per EACH intersection, or fraction thereof, for MAINTENANCE OF EXISTING TRAFFIC SIGNAL INSTALLATION, which payment will be in full for maintaining the traffic signals during said time frame. If for any reason the contractor fails to properly maintain the traffic installation, leading to and requiring a response from the City maintenance forces, the cost of such a response will be charged to the contractor.

**SIGNAL HEAD, POLYCARBONATE, LED, 1 FACE, 3-SECTION, BRACKET MOUNTED**  
**SIGNAL HEAD, POLYCARBONATE, LED, 1 FACE, 5-SECTION, BRACKET MOUNTED**

Description. This item will consist of furnishing and installing a traffic signal head or combination of heads on a street light pole, a traffic signal pole, or a traffic signal post as shown on the plans, as specified herein, or as directed by the Engineer. Specific installations and configurations are shown on Drawing Numbers 834 and 835, entitled "Standard Traffic Signal Mounting Details".

The type of installation will be as indicated on the plans. The number of signal faces, the number of signal sections in each signal face, any dual-indication sections, and the method of mounting will be as indicated in the plans and in the standard drawings.

Each signal face must be pointed in the direction of the approaching traffic that it is to control and must be aimed to have maximum effectiveness for an approaching driver located at a distance from the stop line equal to the normal distance traversed while stopping.

During construction and until the installation is placed in operation, all signal faces must be hooded. The hooding material must be securely fastened so it will not be disturbed by normal inclement weather or wind.

Material. The traffic signal must meet the requirements of Material Specification 1493 for LED signals. The mounting brackets must meet the requirements of Material Specification 1495.

Installation. The signals must be mounted using pole mounting brackets banded to the pole with two strips of 3/4" stainless steel banding single wrapped, one at the top and one at the bottom of the brackets, each secured with a stainless steel banding clip. The banding and clips will be coated with a baked-on black finish. The mounting configuration connecting the signals to the mounting bracket must consist of polycarbonate brackets specifically made for mounting signal heads to the side of poles, to create the designated structure. When the signals are to be mounted on a square pole or flat surface, the bracket used will be bolted to the flat pole or surface using 3/8" drive studs where permissible or using a 3/8" studs in a tapped hole.

The bottom mounting bracket must be accurately located to cover an opening 1" in diameter, for cable entrance, drilled into the pole or standard at a calculated height to position the bottom signal face at a standard height of 10 feet, or a height indicated on the plans. The opening must be reamed or filed to remove all sharp edges or burrs which might damage cable during installation or through vibration when the signals are in operation.

Cable. The Contractor must provide and install a length of 8/C #16 AWG, as per Specification 1475, flexible electrical cord, medium duty, of sufficient length to extend without strain or stress from the terminal strip in the "Green" section of the signal head to the terminal strip in the junction box mounted on the pole. The number of conductors in the cord, and the color coding of the conductors, must be sufficient to match the requirements of the signal head being installed, and must be connected in accordance with Specification 1493. Both ends of the cable length must be carefully stripped of six inches (6") of jacket and one inch (1") of insulation, and each conductor properly tinned. The service cable from the signal heads must enter the pole through the bottom mounting bracket and enter the long sweep elbow to terminate by attachment to the terminal strip in the junction box in accordance with connector schematic, Drawing Number 12268-A

Method of Measurement. This work will be measured per each unit installed, complete.

Basis of Payment. This work will be paid for at the contract unit price for each SIGNAL HEAD, POLYCARBONATE, LED, 1 FACE, 3-SECTION, BRACKET MOUNTED and SIGNAL HEAD, POLYCARBONATE, LED, 1 FACE, 5-SECTION, BRACKET MOUNTED which price will be payment in full for furnishing and installing the signal head complete, including all necessary wiring.

**SIGNAL HEAD, POLYCARBONATE, LED, 1 FACE, 3-SECTION, MAST ARM MOUNTED**  
**SIGNAL HEAD, POLYCARBONATE, LED, 1 FACE, 5-SECTION, MAST ARM MOUNTED**

Description. This item will consist of furnishing and installing a traffic signal head on a traffic signal monotube mast arm, as shown on the plans, as specified herein, or as directed by the Engineer. Specific installations and configurations are shown on Drawing 834 entitled "Standard Traffic Signal Mounting Details".

Each signal face must be pointed in the direction of the approaching traffic that it is to control and must be aimed to have maximum effectiveness for an approaching driver at a distance from the stop equal line to the normal distance traversed while stopping. The optically programmed signal face must be programmed in accordance with the visibility requirements of the Traffic Engineer.

During construction, and until the installation is placed in operation, all signal faces must be hooded. The hooding material must be securely fastened so it will not be disturbed by normal inclement weather or wind.



Material. The traffic signal head construction must meet the requirements of Material Specification 1493 for LED traffic signals. The mast arm bracket must meet the requirements of Material Specification 1463. The cable must meet the requirements of Material Specification 1475.

Installation. The signal must be mounted on the mast arm at the position indicated on the drawing in the manner shown on Drawing 834. The bracket must be banded to the mast arm with the 5/8" banding as shown on Drawing Number 834. The banding and clips must have a baked-on black finish. The bracket must be located over a hole drilled into the mast arm for the installation of cable. The hole must be reamed or filed to remove any sharp edges or burrs which might damage cable during installation or through vibration when the signals are in operation.

Cable. The contractor must provide and install a length of 8/C #16 flexible electrical cord, of sufficient length to extend without strain or stress from the terminal strip in the "Green" section of the signal head to the terminal strip in the junction box mounted on the pole. The number of conductors in the cord, and the color coding of the conductors, must be sufficient to match the requirements of the signal head being installed, and must be connected in accordance with Material Specification 1493 for LED traffic signals. Both ends of the cable length must be carefully stripped of six inches (6") of jacket and one inch (1") of insulation, and each conductor properly tinned. The service cable from the signal heads must enter the traffic signal mast arm through the hole from the mounting bracket, whence it will continue and enter the pole through the hole for mast arm wiring, then extend downward through the pole to enter the long sweep elbow to terminate by attachment to the terminal strip in the junction box in accordance with the terminal strip connector schematic, Drawing Number 12268-A.

The mast arm brackets must be painted gloss black or another color as indicated in the plans.

Method of Measurement. This work will be measured per each signal unit installed, completely wired and operational.

Basis of Payment. This work will be paid for at the contract unit price for each SIGNAL HEAD, POLYCARBONATE, LED, 1 FACE, 3-SECTION, MAST ARM MOUNTED or SIGNAL HEAD, POLYCARBONATE, LED, 1 FACE, 5-SECTION, MAST ARM MOUNTED of the type specified which price will be payment in full for furnishing and installing the signal head, or the optically programmed signal head, complete.

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

Description. This item will consist of furnishing and installing a pedestrian signal on a street light pole, a traffic signal pole or a traffic signal post as shown on the plans, as specified herein, or as directed by the Engineer. The signal may be installed as a single unit on a pole or in combination with other pedestrian signals or with traffic signals of various types and sizes. Specific installations and configurations are shown on Drawing Numbers 834 and 835 entitled "Standard Traffic Signal Mounting Details".

The method of mounting will be indicated on the plans, or as directed by the engineer. Each signal face must be pointed in the direction of the marked cross-walk area for the pedestrians it is intended to control.

Material. The pedestrian signal head material must be consistent with the requirements of Bureau of Electricity Material Specification 1494. The countdown pedestrian signal must meet the requirements of Material Specification 1545. All housing units must be made of polycarbonate. The light source must be LED. Mounting hardware must meet the requirements of Material Specification 1495. Cable must meet the requirements of Material Specification 1475.

Installation. The signal must be mounted using pole mounting brackets banded to the pole with two strips of 3/4" stainless steel banding, single wrapped, one at the top and one at the bottom of the bracket, each secured with a stainless steel banding clip. The banding and clips must have a baked-on black finish. The mounting configuration connecting the signals to the mounting bracket must consist of polycarbonate brackets specifically made for mounting signal heads to the side of poles, to create the designated structure.

The bottom mounting bracket must be accurately located to cover a hole 1" in diameter for the cable entrance drilled into the pole at a height calculated to position the bottom signal face at a standard height of 10 feet, or a height indicated on the plans. The hole must be reamed or filed to remove all sharp edges or burrs which might damage cable during installation, or through vibration when the signals are in operation.

When the pedestrian signal is attached below a traffic signal head, the separate opening for cable may be omitted to eliminate additional weakening of the pole and the pedestrian signal cord will be installed using the same opening as the traffic signal cord.

Cable. The Contractor must provide and install a length of 8/C #16 AWG flexible electric cord, of sufficient length to extend without strain or stress from the terminal strip in the signal head to the terminal strip in the junction box mounted on the pole. The number of conductors in the cord, and the color coding of the conductors, must be sufficient to match the requirements of the signal head being installed, and must be so connected in accordance with Material Specification 1494. Both ends of the cable must be carefully stripped of six inches (6") of jacket and one inch (1") of insulation, and each conductor properly tinned. The service cord from the signal head must enter the pole through the bottom mounting bracket and enter the long sweep elbow to terminate by attachment to the terminal strip in accordance with the terminal strip connector schematic, Bureau of Electricity Drawing Number 12268-A.

During construction and until the installation is placed in operation, all signal faces must be hooded. The hooding material must be securely fastened so it will not be disturbed by inclement weather or wind

Method of Measurement. This work will be measured per each signal unit installed, completely wired and operational.

Basis of Payment. This work will be paid for at the contract unit price each for PEDESTRIAN SIGNAL HEAD, POLYCARBONATE, LED, 1-FACE, BRACKET MOUNTED WITH COUNT DOWN TIMER, which price will be payment in full for furnishing and installing the signal head complete.

## **REMOVE EXISTING TRAFFIC SIGNAL EQUIPMENT**

Description. This work will consist of removing all the existing traffic signal equipment at the intersections listed on the plans.

Removal. The items to be removed will include traffic signal arms, traffic signal poles, traffic signal heads, non-illuminated and illuminated traffic signs, traffic signal controllers, street lighting mast arm and luminaire on combination poles and all associated equipment and cable.

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

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

Method of Measurement. This item will be measured as lump sum per 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 REMOVE EXISTING TRAFFIC SIGNAL EQUIPMENT lump sum per 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 contract lump sum price.

## **REMOVE EXISTING HANDHOLE**

Description. Work under this item will include breaking down an existing handhole or manhole and filling in the affected area to grade. This item includes the complete removal of all City of Chicago manhole or handhole electrical structures. These structures include roadway lighting, traffic signals, communications or other utilities and may be empty.

Demolition. This work will consist of removing the frame and cover of an existing handhole or manhole, breaking down the handhole/manhole walls, removing large debris, and backfilling the hole with screenings or other approved material. Backfill must be installed in 6 inch layers and tamped. If the handhole/manhole is in a parkway, the hole must be filled level to the existing grade. The top six inches of fill must be of an approved soil mixture. If the handhole/manhole is in sidewalk or in pavement, the sidewalk or pavement must be restored under a different pay item. If the frame or cover is deemed re-useable by the Engineer, the frame and/or cover must be delivered to the CDOT at a location identified by the Engineer. Any debris, including the frame and cover must be disposed of off-sight in an approved manner. The Contractor will pay for all disposal fees.

Method of Measurement. This work will be paid for per each manhole or handhole removed. All backfill will be considered as part of the manhole breakdown.

Basis of Payment. This work will be paid for at the contract unit price per each for REMOVE EXISTING 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.

## **REMOVE EXISTING CONCRETE FOUNDATION**

Description. The work will consist of removing a concrete foundation for the specific item referenced. The foundation must be completely removed or broken down to a point three feet below grade, disposing of the debris off-sight in an approved manner, backfilling the excavation with screenings or other approved backfill material, and reconstructing the surface area. If the foundation is in a parkway, the parkway must be properly restored with dirt to the existing level. If the foundation is in sidewalk, the sidewalk must be restored under a different pay item and will not be considered as part of this work. Debris must be disposed of according to Section 202.03 of the Standard Specifications. Backfill must meet the requirements of Section 1003.04 of the Standard Specifications.

Method of Measurement. This work will be measured per each foundation removed, which will also include proper disposal and backfill.

Basis of Payment. This work will be paid for at the contract unit price each for REMOVE EXISTING CONCRETE FOUNDATION, of the type specified, which price will be payment in full for all labor and materials necessary to complete the work as described above. No additional payment will be made for backfill or disposal of debris.

**POLE STEEL, ANCHOR BASE, 10" DIAMETER, 7 GAUGE, 34'-6" (CDOT)**  
**POLE STEEL, ANCHOR BASE, 10" DIAMETER, 3 GAUGE, 34'-6" (CDOT)**  
**POLE STEEL, ANCHOR BASE, 12.5" DIAMETER, 3 GAUGE, 34'-6" (CDOT)**

Description. This item will consist of furnishing, installing, and setting plumb a steel anchor base pole to which equipment may be attached for the extension of the City street light and traffic signal systems.

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

Installation. The pole must be installed on the concrete foundation designed for the particular pole usage as indicated on the plans or as directed by the Engineer. Double nut construction must be used as shown on Drawing 837. Double nut construction provides the proper ventilation, as well as providing a way to plumb the pole. Any exposed portions of anchor rods extending above the nuts which interfere with the installation of the bolt covers must be cut off to provide the necessary clearance. The excess must not be burned off. The pole must be set secure, properly orientated, and plumb using the nuts and washers provided with the anchor bolts. The bolt covers, handhole cover, and pole cap must be securely attached.

The contractor will utilize non-abrasive slinging materials and will otherwise exercise due care in erecting the pole and mast arm to minimize any possible damage to the finish. When necessary, the contractor will utilize, at his own expense, factory approved touch-up materials and methods to restore the finish to like new appearance and durability.

Method of Measurement. This item will be measured per each unit installed, complete with anchor bolt covers, pole cap, and handhole cover.

Basis of Payment. This work will be paid for at the Contract unit price each for a POLE STEEL, ANCHOR BASE, 34'-6, of diameter specified 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.

## **JUNCTION BOX, POLE OR POST MOUNTED**

Description. This item will consist of furnishing and installing a Junction Box on each traffic signal post, traffic signal pole, or street light pole on which a signal head is mounted, as shown on the plans, specified herein, or directed by the Engineer.

Material. The Junction Box must conform to the requirements of Material Specification Number 1407 and to Drawing Number 954. The box will contain a 20 conductor terminal strip, Marathon Special Products Corporation Catalog Number 36002, or equivalent, securely fastened to an Aluminum Terminal Block "Z" Bracket, Leitelt Brother Company Item Number LB-16-6-4B, or equivalent, mounted with two Number 8-24 x 1/2" stainless steel machine screws in tapped holes in the mounting bosses, and located 3/4 inches from the right side facing the open 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 elbows will be equivalent to Leitelt Brothers Company Item Number LB-16-64-A-2. The lower long sweep elbow will be properly positioned over a hole 1 1/2 inches in diameter drilled in the pole approximately 48" above the sidewalk, for the installation of cable. Another 1 1/2 inch hole must be drilled for the upper elbow. The holes must be reamed or filed to remove all sharp edges or burrs which might damage cable during installation, or through vibration when the signals are in operation. A stainless steel, banding bracket, Drawing Number 11984, must be attached to the center of the back of the box with a 5/16"-18 x 1" stainless steel machine screw. The entire unit must be banded to the pole with five (5) 3/4" stainless steel bands, one through the banding bracket and one each at the top and bottom of each elbow. The banding and clips must have a baked-on black finish.

Method of Measurement. This work will be measured per each junction box unit installed, complete with elbow(s).

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

**CONCRETE FOUNDATION FOR TYPE "P" BASE MOUNTED TRAFFIC SIGNAL CONTROLLER (CDOT)**

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

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

Construction. The Contractor will install a concrete foundation for a base mounted traffic signal controller cabinet, as shown on City of Chicago Drawing Number 888 for a "P" cabinet. Work under this item will be performed in accordance with Article 800 of the Standard Specifications.

The foundation will have a minimum depth of at least forty inches (40") below grade and must have large radius conduit elbows in quantity, size and type shown. The elbow ends above ground will be capped with standard conduit bushings. The ground rod will be installed adjacent to the foundation, and will be driven straight down with the top to be no higher than 30 inches below finished grade. The Contractor will furnish anchor bolts, hardware, conduit elbows, and all other material shown on the foundation construction drawing.

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

Method of Measurement. This work will be measured as CONCRETE FOUNDATION FOR TYPE "P" BASE MOUNTED TRAFFIC SIGNAL (CDOT) for each unit installed complete.

Basis of Payment. 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 which price shall include all material and labor required to install this foundation, as per applicable construction plans and these specifications. The conduit elbows will be considered as part of the foundation and will not be paid for as a separate item or as part of the conduit laterals leading to the foundation. All necessary excavation and restoration of parkway to the original condition will be included in the unit price. Any sidewalk removal will be paid for as a separate pay item. However, any restoration of sidewalk will be considered as part of this item, including any expansion joint between the sidewalk and the foundation.

**CONCRETE FOUNDATION, 24" DIAMETER, 1 1/4" ANCHOR RODS, 15" BOLT CIRCLE, 9 FEET (CDOT)**

**CONCRETE FOUNDATION, 24" DIAMETER, 1 1/4" ANCHOR RODS, 15" BOLT CIRCLE, 7 FEET (CDOT)**

**CONCRETE FOUNDATION, 30" DIAMETER, 1 1/2" ANCHOR RODS, 16 1/2" BOLT CIRCLE (CDOT)**

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

Material. Every foundation will be installed at the location designated and in the manner herein specified or in special cases as specifically directed. The contractor will locate foundations as per plan or as directed by the Resident Engineer. A hole must be augered for placement of the concrete form.

CONCRETE FOUNDATION, 24" DIAMETER, 1 1/4" ANCHOR RODS, 15" BOLT CIRCLE, 9 FEET (CDOT) is a foundation for a traffic pole which can accommodate a 26 foot monotube arm (Standard Drawing 818). CONCRETE FOUNDATION, 24" DIAMETER, 1 1/4" ANCHOR RODS, 15" BOLT CIRCLE, 7 FEET (CDOT) is a foundation for arterial street light pole; either steel or aluminum, conventional or davit (Standard Drawing 818). CONCRETE FOUNDATION, 30" DIAMETER, 1 1/2" ANCHOR RODS, 16 1/2" BOLT CIRCLE (CDOT) is a foundation for a traffic pole which can accommodate a 35 foot monotube mast arm (Standard Drawing 817).

Top surface of these foundations in parkway will be at an elevation of two inches (2") above grade or as required by the Engineer. Care must be taken to install a level foundation and to ensure adequate anchor rod projections for double nut installation. The foundations must be centered back from the face of the curb in accordance with dimensions shown on the construction plans. Foundation raceways must consist of large radius conduit elbow(s) in quantity, size and type as specified on the corresponding standard drawing or in the construction plans. Any number of elbows in excess of the number shown on the standard drawing must be paid for under a separate pay item. The elbow ends above ground will be capped with standard conduit bushings. The Contractor must furnish anchor rods, a ground rod, hardware, conduit elbow(s) and all other material shown on applicable foundation construction drawings. Depth of foundation will be as shown on the appropriate drawing. The foundation top must be chamfered 3/4 of an inch. When the foundation is installed in a sidewalk, the foundation must be installed level, with the height of the foundation as close to the height of the sidewalk as possible, or as directed by the Engineer. A proper expansion joint will be installed between the sidewalk and the foundation.

Anchor rods must be set in accordance with applicable construction plans so that when poles are mounted on the foundations, the street lighting mast arm will be properly oriented as indicated on the construction plans. The anchor rods will be set by means of a metal template which shall be submitted for approval before any foundation work is begun. The template must hold the rods vertical, and in proper position. Anchor rods must conform in all respects to the appropriate drawing.

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

Basis of Payment. Payment will be made for foundations installed in place, including elbows, in accordance with construction drawings, constructions plans and these specifications. All necessary excavation and restoration of pavement, sidewalk and fill to their original conditions will be included in the unit price. This work will be paid for at the contract unit price per each for CONCRETE FOUNDATION of the diameter and size specified.



## **ELECTRIC CABLE IN CONDUIT NO. 14, 19/C (CDOT)**

Description. This work will consist of furnishing and installing electric cable for traffic signals of the type, size and number of conductors as specified on the plans. The cable will be rated 600 volts and comply with the following requirements.

Traffic Signal Cable. All cable must conform to the requirements of Material Specification number 1537, for Traffic Signal Cable.

Installation. All cable must be installed in conduit, as indicated on the plans, with care to prevent damage to the insulation or cable. Suitable devices must be used in pulling the cable, and only approved lubricants should be used. All cables installed in conduit will be from the power source to the traffic signal controller cabinet, from the traffic controller cabinet to the traffic signal junction box, or from junction box to junction box. For cable terminating in a traffic signal controller cabinet or traffic signal junction box the following procedures must be followed:

- a. Controllers.
  1. Remove thirty six inches (36") of neoprene jacket.
  2. Wrap vinyl electrical tape on two inches (2") of the neoprene jacket and two inches (2") on the exposed conductors.
  3. Remove one inch (1") of insulation and scrape copper conductor.
  4. Train cables neatly along the base and back of cabinet.
  5. Connect conductors to proper terminal lugs.
- b. Traffic Signal Junction Box.
  1. Remove twenty four inches (24") of neoprene jacket.
  2. Wrap vinyl electrical tape on two inches (2") of neoprene jacket and two inches (2") on the exposed conductors.
  3. Remove one inch (1") of insulation and scrape copper conductor.
  4. Train cables neatly along the side and back of the box.
  5. Connect all conductors to terminal strip.

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

Location	Length of Slack Cable (feet)
Base of Controller	7
Detector, Junction Box	1
Base of Traffic Signal Post or Traffic Signal Pole	4
City Handhole	6
City Manhole	12
Commonwealth Edison Manhole	25

Cable slack in manholes/handholes must be trained and racked in the holes. If racks are non-existent, racks must be provided, and considered incidental and a part of this pay item.

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

Method of Measurement. The length of measurement must be the distance horizontally measured between changes in direction, and will include cable slack. All vertical cables will not be measured for payment.

Basis of Payment. This work will be paid for at the contract unit price per lineal foot for ELECTRIC CABLE IN CONDUIT NO. 14, 19/C (CDOT). 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.

#### **ELECTRICAL MANHOLE, 3'X4'X4', 24" FRAME AND LID (CDOT)**

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

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

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

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

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

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

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

### **HARNESS CABLE, #16, 8/C (CDOT)**

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

Material. The cable must meet the requirements of Material Specification 1475.

Installation. The contractor must install the cable from the required signal or sign terminal strip through the pole and mast arm to the terminal strip in the junction box. The contractor must properly terminate the cable at the terminal strips as directed by the Engineer. Sufficient cable will be provided so as not to unduly strain the cable during installation, and to provide sufficient cable for easy termination.

Method of Measurement. This work will be measured per lineal foot of cable installed. Cable terminations will be considered incidental to this pay item.

Basis of Payment. This work will be paid for at the contract unit price per lineal foot for HARNESS CABLE, #16, 8/C (CDOT), which payment will be in full for furnishing and installing the cable.

### **ADVANCED TRANSPORTATION CONTROLLER, TRAFFIC, 16 LOAD BAY, P CABINET (CDOT)**

Description. This work will consist of furnishing and installing an Advanced Transportation Controller (ATC) and associated equipment in a cabinet onto a foundation and making all necessary connections.

Material. The material must meet the requirements of Material Specification 1558C, "Advanced Transportation Controller and Cabinet". The cabinet will be a P cabinet 55 inches high by 44 inches wide by 26 inches deep with 16 load bays. Each load bay must include a load switch. No communications interface equipment will be included.

Procurement. The contractor must provide Request for Inspection of Material forms for traffic signal controllers and cabinets at the Preconstruction Meeting. The CDOT will review and comment on the submitted material. The CDOT will approve the purchase of the material from a supplier. Final material approval will be made in accordance with CDOT specifications. The Contractor must provide proof of purchase to the Resident Engineer within seven (7) days following approval by the CDOT or within seven (7) days of the contract Notice To Proceed, whichever is later. Payment will be withheld in accordance with the terms and conditions of this contract, until such time that the Engineer determines the requirements are met.

The controllers and cabinets are to be delivered to the CDOT within ninety (90) days of purchase. If the controllers and cabinets are not delivered, payment will be withheld until such time that the controllers and cabinets are delivered.

The CDOT will notify the Contractor when the material has been inspected and approved. Within forty-eight (48) hours of notification, the Contractor will pick-up the controllers and cabinets from the CDOT. The controllers and cabinets will be stored at a facility, approved by the Commissioner, at the contractor's expense.

Installation. The controller will be programmed to provide the sequencing and timing of operation as shown on the plans. The controller must be enclosed in housing and installed in a completely wired cabinet. The model and serial numbers of the controller must be affixed on the front of the controller housing and be readily visible.

The cabinet must be set onto a pad foundation designed specifically for the cabinet, and affixed with four bolts provided with the foundation. Electric cables inside the cabinet must be neatly trained along the base and back of the cabinet. Each conductor used must be connected individually to the proper terminal, and the spare conductors must be insulated and bound into a neat bundle. Each cable must be marked with suitable identification and recorded on a copy of the plans for the intersection and submitted to the Engineer. Signal indications for each direction must be wired to a separate circuit whether or not the signal plans call for a split movement. The absolute zero for the time-base coordinator will be set in the field by City personnel after obtaining the appropriate City time-tone reference.

When properly installed, all signals will be connected and controlled by the controller, and the sequencing and timing of the signals will be as set forth in the plans.

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

CDOT and Office of Emergency Management and Communications (OEMC) personnel must be present when the new signal equipment is put into operation.

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

## **ELECTRIC CABLE IN CONDUIT NO. 4, 2/C (CDOT)**

Description. This work will consist of furnishing and installing electric cable as specified. The cable will be installed in conduit underground.

Material. The cable must meet all requirements of Material Specification 1534.

Construction Method. All cables must be installed with care to prevent damage to the cable. Any defects found in the cable must be reported to the resident engineer. Damaged cable must be replaced. The cable must be pulled into the conduit with a minimum of dragging on the ground or pavement. This will be accomplished by means of reels mounted on jacks or other suitable devices located for unreeling cable directly into duct. Lubricants must be used to facilitate installation if deemed necessary by the contractor.

Bends in the cable will conform to the recommended minimum radii as outlined in the National Electric Code.

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

Where cable runs continue from manhole to manhole without tapping within a light pole, they will be continuous without splices unless authorized by the resident engineer.

All wire or cable in the distribution panels and control cabinets must be properly trained and have sufficient slack provided for any rearrangement of equipment or future additions. There must be at least two feet of slack in a street light pole base or street light controller base. A handhole must have at least five feet of slack and a manhole at least ten feet of slack.

Method of Measurement. The length of cable furnished and installed will be measured as the length of conduit plus three feet for cable entering and leaving a light pole or street light control cabinet, plus any slack in manholes or handholes.

Basis of Payment. This work will be paid for at the contract unit price per lineal foot for ELECTRIC CABLE IN CONDUIT NO. 4, 2/C (CDOT). Such price will be payment in full for furnishing, installing, and testing the cable, and will include all material, labor, terminations, and incidentals necessary to complete the work as per the contract plans.

**MAST ARM, STEEL, MONOTUBE, 26 FOOT (CDOT)**  
**MAST ARM, STEEL, MONOTUBE, 35 FOOT (CDOT)**

Description. This item will consist of furnishing and installing a steel, monotube, mast arm for the purpose of supporting traffic signals, and/or illuminated signs on an anchor base pole at the locations shown on the plans, or as specified or directed by the Engineer. The length of the mast arm and the angular orientation of the arm relative to the centerline of the roadway will be as indicated on the plans.

A mast arm must be installed only on a 3 gauge pole, and the length of the mast arm will govern the minimum base diameter of the pole on which the arm is to be installed, in accordance with the following chart:

MAST ARM LENGTH (feet)	POLE BASE DIAMETER (inches)
16	10
20 10	10
26 10	10
30 11	11
35 12.5	12.5
40 12.5	12.5
44 12.5	12.5

Material. The mast arm must be 7 gauge steel meeting the requirements of Standard Drawing 870 and Material Specification 1454.

Installation. The mast arm must be mounted on the pole at the height specified on Drawing 834, or at a different height if specified on the plans, or as directed by the Engineer. A one inch (1") diameter opening for the installation of cable must be field drilled in the pole in line with the orientation of the mast arm. The hole must be reamed or filed to remove all sharp edges or burrs which might damage cable during installation, or through vibration when the signals are in operation. A neoprene grommet must be inserted into the finished hole prior to the installation of the cable.

Two holes must be field drilled in the pole at 180 degrees relative to the orientation of the pole for installation of locator shear pins, provided with the back plate, to prevent rotation of the mast arm. These holes must be drilled after the mast arm is in place in order that the position of the holes will match the location of the locator bushings attached to the back half of the clamp.

All signals, signs, and electrical equipment must be attached in the correct relative position to the mast arm, with service cord in place, prepared to be installed on the pole, prior to the attachment of the mast arm to the pole. The installation of the cord in the pole must be coordinated with the attachment of the mast arm to the pole. The clamp bolts must be tightened securely so that there is no slippage of the mast arm either upward or downward to exert a vertical force on the shear pins. The end cap must be secured in place with the attachment screws provided.

The mast arm must be delivered completely finished with a factory applied black powder coat per Material Specification 1454. The contractor must utilize non-abrasive slinging materials and must otherwise exercise due care in erecting the pole and mast arm to prevent any damage to the finish.

Method of Measurement. This work will be measured per each monotube arm installed on a traffic pole.

Basis of Payment. This work will be paid for at the contract unit price for each MAST ARM, STEEL, MONOTUBE of the length indicated or MAST ARM, STEEL, MONOTUBE, 26 FOOT (CDOT) and MAST ARM, STEEL, MONOTUBE, 35 FOOT (CDOT), and will be payment in full for furnishing and installing a steel mast arm in place, complete. Attachment of signals and signs will not be part of this pay item.

### **SERVICE INSTALLATION, 100 AMPERE (CDOT)**

Description. This work will consist of providing a service connection from City cable to a Commonwealth Edison secondary cable. For an aerial service, this will be on a wood pole. For an underground service, this will be in a CECO manhole.

Installation. This work will consist of splicing or terminating City service cable to a Commonwealth Edison secondary cable, as directed by the Engineer. The contractor must obtain permission from Edison for the service at the required location. The contractor will inform Edison of the load required. Edison will make the connections, unless Edison gives the contractor permission to make the connections. Any costs associated with the connection will be borne by the contractor.

Method of Measurement. The service connection will be counted as one unit, and will include all labor and material needed to make a successful service connection.

Basis of Payment. This work will be paid for at the contract unit price for each SERVICE INSTALLATION, 100 AMPERE (CDOT), which payment will be in full for providing all material and labor to make the necessary connections.



**UNDERGROUND CONDUIT, PVC, 2" DIA. SCHEDULE 80 (CDOT)**  
**UNDERGROUND CONDUIT, PVC, 3" DIA. SCHEDULE 80 (CDOT)**  
**UNDERGROUND CONDUIT, PVC, 4" DIA. SCHEDULE 80 (CDOT)**

Description. This work will consist of furnishing and installing a conduit lateral of the type and size specified including fittings and accessories as part of the raceway either laid in trench or bored and pulled in place.

Underground conduits shall be furnished and installed according to Section 810 of the Standard Specifications and as describe herein.

Materials. 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-80. Conduit color will be determined by the Resident Engineer.

Construction.

Definition of Laterals. A lateral will mean a conduit raceway extending from one sub-surface location to another sub-surface location, and in every case intended to encase electric circuit cable under paved surfaces, or in unpaved parkway, street or alley, where specifically designated.

Locations. Laterals must be installed at the locations shown on the construction plans. Laterals must be installed in the shortest practicable line between points of termination, or under adverse conditions, as directed by the Resident Engineer. Laterals not shown on the drawing, but necessary to be installed will be paid for at the unit price bid for laterals as additional units of construction.

Installation Requirements. Installation of the underground raceways shall be done according to Article 810.04 of the Standard Specifications and as describe herein.

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. All underground conduits must have a minimum cover of thirty inches (30") below grade. If conduit cannot be installed with a minimum cover of thirty inches (30"), the conduit must be encased in concrete for protection. The method of encasement and protection must be approved by the engineer. Concrete encasement will be paid for as a separate pay item.

When multiple laterals in a common trench are required, no more than three (3) three inch (3") or smaller conduit laterals can be laid on a single, horizontal level. Four or more conduit laterals must be installed on two (2) levels in accordance with instructions of the Resident Engineer.

Conduit laterals installed under vaulted walks must be securely attached to the retaining wall by means of galvanized clamps and clamp backs held in place by anchor bolts. Laterals will be fastened as close to the underside of the sidewalk as possible, and securing clamps installed every five feet (5'). Laterals must be continuous through party walls.

Threaded fittings and bends of the same material as conduit must be furnished and installed as required. Threadless couplings may be used only for splicing existing conduit. All conduit splices, where required, will be considered incidental to this pay item.

Method of Measurement. The length measured will be the number of lineal feet of conduit installed and accepted, measured in place. The length for measurement will be the distance horizontally between changes in the direction of the conduit.

Basis of Payment. This work will be paid for at the contract unit price per lineal foot for UNDERGROUND CONDUIT, PVC of the type and size as specified, which price will be payment in full for furnishing and installing the conduit and fittings complete. Cleaning, swabbing, and p-lining of new conduit will be incidental to this pay item.

#### **PAINT EXISTING POLE, POST OR CONTROLLER, COMPLETE**

Description. This work will consist of field painting existing steel and aluminum structures including poles and arms that support street lights and traffic control signals, controller cabinets for street lights and traffic signals, traffic signal housings, and street light luminaire housings.

Material. All paints and painting materials intended for applications specified herein must be certified by the Contractor to be of highest quality, must be from the same manufacturer, and must conform to the following, as applicable:

Naptha. The solvent to be used for wiping down all metallic surfaces prior to application of paint must be NAPTHA conforming to ASTM Standard D838.

Primer. This paint must meet the requirements of Section 4 (composition) and Section 5 (properties) of the Steel Structures Painting Council's Paint Specification No. 25 for red iron oxide, zinc oxide, raw linseed oil and alkyd primer as outlined in Volume 2, Systems and Specifications, Third Edition.

Intermediate Coat. The paint must meet the same requirements as the primer except that it will contain a contrasting shade of iron oxide/ or be tinted or shaded to produce a distinct contrast of at least 10 Hunter Delta E units compared to the primer.

Finish Coat. This paint must meet the requirements of Section 4 (composition) and Section 5 (properties) of the Steel Structures Painting Council's Paint Specification No. 21 for lead free white or colored silicone alkyd paint, Type 1, high gloss as outlined in Volume 2, Systems and Specifications, Third Edition.

Color. A paint sample must be submitted for approval prior to authorization to paint. The color will be as specified by the Engineer. The sample must be in the form of a 4" by 8" color chip. The Contractor must provide a field-painted sample, if requested by the Commissioner. The field sample must be of the same type of equipment to be painted and will be chosen by the Commissioner. Color will be green, gray, black, or another color as specified.

Product Data. The Contractor must submit the manufacturer's technical information, label analysis, and application instructions for each material proposed for use. Each material must be listed and cross-referenced for the specific coating, finish system, and application. Each material must include the manufacturer's catalog number.

Delivery, Storage and Handling. The Contractor must deliver, store, and handle the paint as herein specified.

The materials must arrive at the job site in the manufacturer's original, unopened packages and containers bearing the manufacturer's name label, product name, product description, manufacturer's stock number, date of manufacture, contents by volume for pigment and vehicle constituents, thinning instructions, application instructions, and color name and number.

Materials to be stored should be kept in tightly covered containers in a well ventilated area at a minimum ambient temperature of 45° Fahrenheit.

#### Preparation of Surfaces.

Steel Surfaces. Remove loose or scaling paint, dirt, oil grease, rust and foreign matter, as necessary, to receive paint. Wire brushing, where specified herein, must be done with an approved power tool operated from a portable power source. After wire brushing, the complete surface must be thoroughly wiped with a rag containing NAPTHA.

Aluminum Surfaces. Remove loose scale and paint, dirt, oil, grease and foreign matter, as necessary, to receive paint. Wire brush surfaces, where necessary, to remove loose scale. Wire brushing, where specified herein, must be done with an approved power tool operated from a portable power source. After wire brushing, the complete surface must be thoroughly wiped with a rag containing NAPTHA.

Weather Conditions. Do not apply paint coatings when temperature is below 40° F., or during periods of rain, fog, snow, or when relative humidity is above 85 %.

Application Conditions. Surfaces to be painted must be clean, dry, and relatively smooth. Each paint coating must be applied smoothly and worked out evenly. Paint must be thoroughly mixed just prior to application. Thinning must be held to a minimum, and must be done only when required for proper application. Thinners to be used will be the manufacturer's recommended thinner for the paints used; mixed thoroughly to assure complete blending with the coating. Spray painting will not be permitted when wind conditions are greater than 15mph. Painting must be done as soon after cleaning as possible.

### Detail Painting Requirements.

Street Light Poles. Street light poles to be painted under these specifications are steel structures which will vary from twenty-seven (27) to thirty (30) feet in height, with average surface required to be painted of approximately forty-eight (48) square feet. Some rusting and/or bare spots will be encountered which the Contractor will be required to wire-brush. The pole must be thoroughly wiped with NAPTHA, and the finish coating applied.

Mast Arm Brackets and Electrical Luminaries. Mast arms which are attached to the street light poles will consist of 2-inch steel pipe sections which will vary between eight feet (8') and fifteen feet (15') in length. Mast arms in twelve foot (12') and 15 foot (15') sizes will have a supporting strut of two inch (2") steel pipe. Surface scale and rust will be wire-brushed, and these mast arms thoroughly wiped with NAPTHA, and finish painted .

Traffic Signal Post. Aluminum and steel posts consist of five inch (5") pipe sections atop a conical base or base flange sixteen inches (16") in diameter, and will vary in height from three feet six inches (3' - 6") to twenty feet (20'). Spot scaling must be wire-brushed and the posts thoroughly wiped with NAPTHA, and finish painted.

Street Light Controllers. The control cabinets will be cast aluminum and are approximately 18" x 14" x 30" in size. They will be mounted atop a three foot six inch (3' 6") high post. The Contractor will wire-brush, as necessary, and thoroughly wipe the complete cabinet and casting with NAPTHA, and apply a finish coating .

Basis of Payment. This work will be paid for at the contract unit price each for PAINT EXISTING POLE OR CONTROLLER, COMPLETE which will be payment in full for all labor and materials necessary in painting the existing equipment.

### **PEDESTRIAN PUSH-BUTTON, SPECIAL**

Description. This item will consist of furnishing and installing a push button switch and housing on a traffic signal pedestal or pole, as shown on the plans, as specified herein, or as directed by the Engineer. Specific installation data is shown on Drawing Number 834 entitled "Standard Traffic Signal Mounting Details".

Material. The push button assembly must meet the requirements of Material Specification 1517. The electrical cord must meet the requirements of Material Specification 1534.

Installation. The push button assembly must be banded on the pole or pedestal at the mounting height shown on Drawing Number 834 using 3/4" stainless steel banding , one band each at the top and the bottom of the unit. The banding must have a baked-on black finish. The unit must be mounted on the side of the pole nearest the cross walk which the signals control, the position being at approximately 90 degrees from the face of curb. The push button must be located at a height of 42" above sidewalk grade. A hole 3/4" in diameter must be drilled in the pole at the proper height for the installation of cable. The hole must be reamed or filed to remove any sharp edges or burrs which might damage cable during installation or through vibration when the signals are in operation.

The Contractor must provide and install two lengths of flexible electrical cord. The cable must be of sufficient length to extend without strain or stress from the push button to which it is connected at one end, to the terminal strip in the junction box mounted on the pole. 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.

Method of Measurement. This work will be measured per each unit installed, completely wired and operational.

Basis of Payment. This work will be paid for at the contract unit price each for a PEDESTRIAN PUSH-BUTTON, SPECIAL which price will be payment in full for furnishing and installing the push button complete with its component parts and appurtenances.

**ELECTRICAL HANDHOLE, 30", 24" FRAME AND LID (CDOT)**  
**ELECTRICAL HANDHOLE, HEAVY DUTY, 36", 24" FRAME AND LID (CDOT)**

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

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

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

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

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

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

Basis of Payment. The necessary excavation, backfilling and restoration of parkway and pavement must be made in accordance with the foregoing specifications, and the cost thereof must be included in the unit price each for installing ELECTRICAL HANDHOLE, 30", 24" FRAME AND LID (CDOT) or ELECTRICAL HANDHOLE, HEAVY DUTY, 36", 24" FRAME AND LID (CDOT). 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.

## **ROD AND CLEAN DUCT IN EXISTING CONDUIT SYSTEM (CDOT)**

Description and Scope. This work will consist of inserting a duct rod or electrical fish rod or tape of sufficient length and rigidity into an electrical conduit opening in one electrical manhole or handhole, and pushing the said rod through the conduit to emerge at the next or subsequent manhole in the conduit system at the location shown on the plans. The duct rod may be inserted and removed by any standard construction method which causes no damage to the conduit system. The size of the conduit may vary from two inch (2") to four inch (4"), but there will be no differentiation in cost for the size of the conduit.

The conduit system which is to be rodded and cleaned may exist with various amounts of standing water in the manholes. The contractor must pump the water or sufficient water from the manholes to drain the conduit and to afford compatible working conditions for the installation of the duct rods and/or cables. The pumping of the manholes will be incidental to the work of rodding and cleaning of the conduit.

Any manhole which, in the opinion of the Resident Engineer contains excessive debris, dirt or other materials to the extent that conduit rodding and cleaning is not feasible, will be cleaned at the Engineer's order and payment approved as a separate pay item, and not a part of this specification.

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

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

Basis of Payment. This work will be paid for at the contract unit price per lineal foot for ROD AND CLEAN DUCT IN EXISTING CONDUIT SYSTEM (CDOT) for the installation of new electric cables. Such price will include the furnishing of all necessary tools, equipment, and polyethylene line as required to prepare a conduit for the installation of cable. When the number of cables to be installed requires the use of more than one conduit in the same run, each additional conduit required will be rodded and cleaned as a separate unit and paid for at the contract unit price.

## **WIRELESS DETECTOR PACKAGE (CDOT)**

Description. This item will consist of furnishing and installing a wireless detector package. The wireless detector package shall consist of a pole mounted transceiver/transmitter (access point), wireless repeaters, processor cards (contact closure cards), and related equipment to be used in conjunction with traffic controllers used by the City of Chicago.

Material. The wireless detector package must meet the requirements of Material Specification 1573.

Installation. The wireless detector package must be programmed and installed per the manufacturer's instructions to meet the requirements of the plans and the traffic engineer for the area of detection required.

Method of Measurement. This work will be measured per each unit installed, complete.

Basis of Payment. This work will be paid for at the contract unit price for each WIRELESS DETECTOR PACKAGE (CDOT) which price will be payment in full for furnishing and installing the wireless detector package complete, including all programming.

### **FLUSH MOUNTED WIRELESS SENSOR (CDOT)**

Description. This work will consist of furnishing and installing a flush mounted wireless sensor in pavement.

Material. The flush mounted wireless sensor must meet the requirements of Material Specification 1573.

Installation. The flush mounted wireless sensor shall be installed in a small core drilled hole per manufacturer's instructions.

Method of Measurement. This work will be measured per each unit installed, complete.

Basis of Payment. This work will be paid for at the contract unit price for each FLUSH MOUNTED WIRELESS SENSOR (CDOT) which price will be payment in full for furnishing and installing the flush mounted wireless sensor complete, including all programming.

### **CAT 5 CABLE FOR WIRELESS DETECTOR (CDOT)**

Description. This work will consist of furnishing and installing CAT 5 cable as specified. The cable will be installed in conduit. The cable will be used for a radio receiver mounted on a column.

Material. The Cat 5 cable must meet the requirements of Material Specification 1573.

Construction Method. All cable 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 at no cost to the City. The cable will be terminated at one end in a traffic signal controller cabinet at the interface panel. The cable will be terminated at the other end to female to female connector to be located in the junction box on the traffic signal pole. The cable will run in underground conduit, handholes, manholes, conduit risers, and traffic signal pole shafts. The cable must be pulled with a minimum of friction. Lubricants will be used to facilitate installation if deemed necessary. Bends in the cable must conform to the recommended minimum radius as outlined in the National Electric Code. No splicing of the cable will be allowed. Cable passing through manholes must be trained and racked around the sides of the manhole into a permanent position. If racks are non-existent or in poor condition, the contractor must install racks. The material must be approved by the resident engineer. Any material and labor involved in training and racking the cable will be considered incidental to the cost of this pay item. Cable in a handhole will have at least five feet of slack and cable in a manhole will have at least ten feet of slack.

Method of Measurement. The length of cable furnished and installed will be measured as the entire length of cable; measurements being taken both vertically and horizontally, plus any slack in manholes or handholes.

Basis of Measurement. This work will be paid for at the contract unit price per lineal foot for CAT 5 CABLE FOR WIRELESS DETECTOR (CDOT). Such price will be payment in full for furnishing, installing, terminating, and testing the cable, and will include all material, labor, and incidentals necessary to complete the work and complete an operating and working circuit as per the plans. The connectors at each end of the cable will be considered incidental to this item.



### **CONNECTORS FOR CAT 5 CABLE (CDOT)**

Description. This item will consist of installing connectors for CAT 5 cable.

Material. The connectors for CAT 5 cable must meet the requirements of Material Specification 1573.

Installation. The connectors for CAT 5 cable must be installed per the manufacturer's instructions to meet the requirements of the plans and the traffic engineer.

Method of Measurement. This work will be measured per each unit installed, complete.

Basis of Payment. This work will be paid for at the contract unit price for each CONNECTORS FOR CAT 5 CABLE (CDOT) which price will be payment in full for installing the connectors for the CAT 5 cable.

### **PEDESTRIAN PUSH BUTTON SIGNAL POST**

Description. This item will consist of furnishing and installing a steel post, for supporting a push button for pedestrian traffic, in a concrete sidewalk, at the location shown on the plans, or as directed by the Engineer. The post installation itself must be consistent in construction to the post shown on Drawing Number 963, "Pedestrian Push Button Post".

Material. The post will be three inch (3") galvanized rigid steel conduit meeting the requirements of Material Specification 1462. The top of the post will be threaded for a length of two inches (2"). The bottom of the post will be threaded for a length of three and one-half inches (3.5"). A threaded conduit cap will be provided for the top. The base material will consist of a three and one-half inch (3.5") length of threaded conduit coupling circumferentially welded to a base plate. The base plate will be dimensioned as shown on Standard Drawing 963. The base plate will be made of a high strength low alloy steel meeting the requirements of ASTM A595, Grade A. The post, base, and cap must be powder coated black. Post threads must not be painted. The painting method must be pre-approved by the Engineer.

Installation. A hole must be drilled into the post at the proper height and location for the pedestrian push button wiring. The post must be screwed into the base. The post may be tack welded to the base to insure the two parts do not loosen. The post and base must be mounted in the sidewalk using a minimum of 1/2" concrete anchors of the appropriate length. ( Please note that cable must be pulled into the post before the post is mounted to the sidewalk.) The nuts on the rods must be tightened to secure the post to the sidewalk such that there is no space separating the post from the sidewalk. There must be no double nutting. The post must be plumb; the use of shims will not be permitted. The post cap must be secured by screwing into the top of the pipe. After the post is erected, the Engineer will determine if touch-up paint is required.

Method of Measurement. This work will be measured per each unit installed, complete with anchors, nuts, base, steel pipe, and post cap. Concrete work, wiring, and push buttons will not be included in this item.

Basis of Payment. This work will be paid for at the contract unit price each for a PEDESTRIAN PUSH BUTTON SIGNAL POST, which will be payment in full for furnishing and installing the post complete in place.

### **ELECTRIC CABLE NO. 12, 2/C (SHIELDED) (CDOT)**

Description. This work will consist of furnishing and installing a shielded lead-in cable

Material. The cable must be rated 600 Volts, 90° Centigrade wet and dry. The cable will have soft annealed tinned copper conductors with a PVC insulation and a PVC jacket overall with an appropriate shield. The cable will be equal to that manufactured by Belden, for instrumentation/process control tray cable, Part No. 9343, or an approved equal.

Installation. The Contractor will install the cable from the existing traffic controller to the manhole/ hand hole as indicated on the contract plan drawing or as directed by the Commissioner. The Contractor must splice the cable to the detector loop cable in the manhole or handhole. The other end of the cable must be terminated at the controller.

### **CABLE SLACK**

The length of cable slack that must be provided will be in accordance with the following schedule:

<u>Location</u>	<u>Length of Slack Cable (feet)</u>
Base of Controller	7
Detector, Junction Box	1
Base of Traffic Signal Post or Traffic Signal Pole	4
City Handhole	6
City Manhole	12
Commonwealth Edison Manhole	25

Cable slack in manholes/handholes must be trained and racked in the holes. If racks are non-existent, racks must be provided, and considered incidental and a part of this pay item.

Method of Measurement. The length of measurement shall be the distance horizontally measured in feet between changes in direction, and shall 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 foot for ELECTRIC CABLE NO. 12, 2/C (SHIELDED) (CDOT) as specified. This price shall be payment in full for furnishing, installing, connecting, splicing, and testing of cable, and shall include all labor, materials, equipment, tools, and incidentals necessary to complete the work, as specified herein, and as shown on the plans.

### **SIGNAL HEAD, POLYCARBONATE, LED, 1-FACE, 3-SECTION, STRUCTURE MOUNTED (CDOT)**

Description. This item will consist of furnishing and installing a traffic signal head mounted on structure as specified herein, or as directed by the Engineer.

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.

Materials. The traffic signal must meet the requirements of Material Specification 1493 for LED signals. The mounting brackets must meet the requirements of Material Specification 1495.

Installation. Mounting: Contractor shall provide the shop drawings for mounting the traffic signal on the structure for engineer's approval.

Cable: The Contractor must provide and install a length of 8/C #16 AWG, as per Specification 1475, flexible electrical cord, medium duty, of sufficient length to extend without strain or stress from the terminal strip in the "Green" section of the signal head to the terminal strip in the junction box mounted on the pole. The number of conductors in the cord, and the color coding of the conductors, must be sufficient to match the requirements of the signal head being installed, and must be connected in accordance with Specification 1493. Both ends of the cable length must be carefully stripped of six inches (6") of jacket and one inch (1") of insulation, and each conductor properly tinned. The service cable from the signal heads must enter the pole through the bottom mounting bracket and enter the long sweep elbow to terminate by attachment to the terminal strip in the junction box in accordance with connector schematic, Bureau of Electricity Drawing Number 12268-A

Method of Measurement. This work will be measured per each unit installed, complete which includes all the brackets, tubes, mounting hardware and wiring as noted above.

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

### **PEDESTRIAN SIGNAL HEAD, POLYCARBONATE, L.E.D., COUNTDOWN, STRUCTURE MOUNTED (CDOT)**

Description. This item will consist of furnishing and installing a pedestrian head mounted on structure as specified herein, or as directed by the Engineer.

During construction and until the installation is placed in operation, all signal faces must be hooded. The hooding material must be securely fastened so it will not be disturbed by normal inclement weather or wind.

Materials. 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. Mounting: Contractor shall provide the shop drawings for mounting the pedestrian signal on the structure for engineer's approval.

Cable: The Contractor must provide and install a length of 8/C #16 AWG, as per Specification 1475, flexible electrical cord, medium duty, of sufficient length to extend without strain or stress from the terminal strip in the "Green" section of the signal head to the terminal strip in the junction box mounted on the pole. The number of conductors in the cord, and the color coding of the conductors, must be sufficient to match the requirements of the signal head being installed, and must be connected in accordance with Specification 1493. Both ends of the cable length must be carefully stripped of six inches (6") of jacket and one inch (1") of insulation, and each conductor properly tinned. The service cable from the signal heads must enter the pole through the bottom mounting bracket and enter the long sweep elbow to terminate by attachment to the terminal strip in the junction box in accordance with connector schematic, Bureau of Electricity Drawing Number 12268-A

Method of Measurement. This work will be measured per each unit installed, complete which includes all the brackets, tubes, mounting hardware and wiring as noted above.

Basis of Payment. This work will be paid for at the contract unit price each for PEDESTRIAN SIGNAL HEAD, POLYCARBONATE, L.E.D., COUNTDOWN, STRUCTURE MOUNTED (CDOT) which price will be payment in full for furnishing and installing the signal head complete.

## **REMOVE EXISTING TRAFFIC SURVEILLANCE EQUIPMENT**

Description. This work shall consist of the removal and disposal of existing traffic surveillance equipment and their foundations.

General Requirements. No removal work will be permitted without approval from the Engineer. Removal shall start as soon as the temporary ITS or permanent ITS, as applicable, is placed in approved operation. An inspection and approval by the Engineer will take place before any associate proposed permanent or temporary ITS is approved for operation.

Removal of Traffic Surveillance Equipment: Any damage resulting from the removal and/or transportation of the Traffic Surveillance Equipment and associated hardware, shall be repaired or replaced in kind. The Engineer will be the sole judge to determine the extent of damage and the suitability of repair and/or replacement.

Abandoned underground Traffic Surveillance cables shall be removed with conduit to a depth of 1 ft (300 mm) below ground level and the hole shall be backfilled.

Conduit hangers, straps, and supports shall be removed from bridge steel as directed by the Engineer. Where the conduit system is removed from parapet walls and other concrete surfaces, the Contractor shall cut off the anchor device 1 in. (25 mm) below the surface of the concrete, and fill all voids with portland cement concrete mortar, making a smooth finish to the concrete surface.

Unprotected bridge steel which is exposed by the removal of the conduit system shall be touched up using a paint and procedure approved by the Engineer.

(a) Removal of Traffic Surveillance Equipment, No Salvage. When indicated, Traffic Surveillance Equipment and all associated hardware and appurtenances shall become the property of the Contractor and shall be disposed of according to Article 202.03.

(b) Removal of Traffic Surveillance Equipment, Salvage. When indicated, Traffic Surveillance Equipment, and all associated hardware and appurtenances shall remain the property of the Department and shall be delivered to a Department facility within the District and unloaded and stacked there, as directed by the Engineer. Wood blocking, banding, or other appurtenant items required for proper stacking and protection shall be included.

Traffic Surveillance Equipment shall be removed, boxed in new containers, approved by the Engineer, and delivered to a Department facility, as designated by the Engineer. The Contractor is responsible for paying for the shipping of Traffic Surveillance Equipment included in this special provision and will not be paid separately for shipping costs.

Removal of Traffic Surveillance Equipment Foundation: Concrete foundations shall be removed to at least 2 ft (600 mm) below grade, with removed material disposed of according to Article 202.03. The removal shall extend deeper where required to facilitate roadway construction at no additional cost to the Department. Underground conduits and cables shall be separated from the foundation at 2.5 ft (750 mm) below grade and shall be abandoned or re-used as indicated.

The void caused by the removal of the foundations shall be backfilled according to Article 841.02.

Basis of Payment. Removal of existing Traffic Surveillance Equipment shall be paid for at the contract LUMP SUM (L SUM) price.

### **WOOD POLE, 45 FT., CLASS 5**

Description. This item shall consist of furnishing and installing a wood pole, as specified herein and all hardware and accessories required for the intended use of the pole.

Materials. Materials shall include but limited to the following Articles of Section 1000 - Materials

Item	Article/Section
(a) Wood Pole.....	1069.04
(b) Weatherhead.....	1086.02(a)
(c) Rigid Metal Conduit.....	1088.01(a)
(d) Expansion Fittings for Raceways.....	1088.02
(e) Fasteners and Hardware.....	1088.03

### **CONSTRUCTION REQUIREMENTS**

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

Rigid Metal Conduit shall be 2" Galvanized Steel unless otherwise indicated on the plans or as approved by the Engineer.

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

Basis of Payment. This item shall be paid at the contract unit price each for WOOD POLE, of the class and length indicated.

## **MAINTAINING ITS DURING CONSTRUCTION**

Description. Intelligent Transportation Systems (ITS) references IDOT traffic surveillance infrastructure. These elements include, but are not limited to, the following: induction loops, ramp meters, closed circuit television cameras, dynamic message signs, highway advisory radios, Radar Vehicle Sensing Device (RVSD), copper and fiber optic communication cables, power cables, cabinets, and communication equipment.

General Requirements. Effective the date the Contractor's activities (ITS or otherwise) at the job site begin, the Contractor shall be responsible for the proper operation and maintenance of ITS elements which are part of, or which may be affected by the work until final acceptance or as otherwise determined by the Engineer.

Before performing any excavation, removal, or installation work (ITS or otherwise) at the site, the Contractor shall initiate a request for a maintenance transfer and preconstruction inspection, to be held in the presence of the Engineer and a representative of the party or parties responsible for maintenance of any ITS systems which may be affected by the work. The request for the maintenance preconstruction inspection shall be made no less than seven (7) calendar days prior to the desired inspection date.

Existing ITS elements, when depicted on the plans, are intended only to indicate the general equipment installation of the systems involved and shall not be construed as an exact representation of the field conditions. It remains the Contractor's responsibility to visit the site to confirm and ascertain the exact condition of the ITS components and systems to be maintained.

Existing ITS components shall be defined as any ITS component or device in service at the time of the commencement of construction activities. The contract drawings indicate the general extent of any existing ITS elements, but whether indicated or not, it remains the Contractor's responsibility to ascertain the extent of effort required for compliance with these specifications, and failure to do so will not be justification for extra payment or reduced responsibilities.

Maintaining ITS During Construction - The Contractor's responsibility shall include protecting in place any cables, conduits, handholes and ITS devices in or adjacent to the work zone. The Contractor shall coordinate Maintaining ITS activities with adjacent IDOT projects.

Rerouted ITS Communication Cables - The Contractor is responsible for maintaining the fiber and copper communication cables that have been rerouted from the median barrier wall by others. This existing communication and infrastructure must be properly maintained for the duration of construction activities. During pier removal and reconstruction activities, the Contractor will be responsible for maintaining the rerouted ITS cables through the work zone. This may require the Contractor to detach the conduit from the barrier wall or other structure and protect in place during pier removal and reconstruction activities. Slack has been provided in the rerouted cables to facilitate this. The Contractor is responsible for reattaching the conduit to the median barrier or other structure, as necessary, on the CTA side of the barrier once pier removal and reconstruction activities are complete.

All work required to maintain ITS infrastructure as depicted in the plans or otherwise necessary and as provided for in this special provision shall be paid for under the Maintaining ITS During Construction pay item. No component items germane to this work shall be paid for separately.

Method of Measurement. The Contractor shall demonstrate to the satisfaction of the Engineer that the ITS components or devices have been properly protected prior to submitting a pay request. In order for final payment to be released the Contractor must demonstrate that the equipment is working as intended following inspection by the Engineer. Failure to do so will be grounds for denying the pay request.

Basis of Payment. Maintenance of ITS components and devices during Construction shall be paid for at the contract unit price per calendar month (Cal Mo) for **MAINTAINING ITS DURING CONSTRUCTION**, which shall include all work as described herein.

### **TRAFFIC SURVEILLANCE. – GENERAL (TSC T 400#02)**

Effective: June 1, 1994                      Revised: July 21, 2011

1.0 The following supplements applicable sections of Section 800 of the Standard Specifications for Road and Bridge Construction.

The intent of this Special Provision is to prescribe the materials and construction methods commonly used in traffic surveillance installations. All material furnished shall be new. The locations and the details of all installations shall be as indicated on the Plans or as directed by the Engineer.

When the road is open to traffic, except as otherwise provided, the Contractor may request a turn on and inspection of all complete traffic surveillance installations system. This request must be made to the Engineer a minimum of seven (7) working days prior to the time of the requested inspection. Upon demonstration that all surveillance is operational and all work is completed in accordance with the contract and to the satisfaction of the Bureau of Traffic Operations Electrical Engineer, The Bureau of Traffic Operations Electrical Engineer will then allow all of the surveillance to be placed in continuous operation. The Agency that is responsible for the maintenance of the traffic surveillance installations will assume the maintenance upon successful completion of this inspection.

Projects which call for the storage and re-use of existing traffic surveillance equipment shall have a 30 day test period prior to project acceptance.



### 1.1 DEFINITION OF TERMS.

Whenever in these Special Provisions the following terms are used, the intent and meaning shall be interpreted as follows:

Induction Loop - A continuous non-spliced wire, three turns, permanently placed and sealed in sawcuts in the roadway and adjacent area, used in conjunction with an induction loop detector sensor unit.

State Highway Communications Center - The main communication control facility of the Illinois Department of Transportation with present offices at 201 W. Center Court, Schaumburg, Illinois 60196-1096.

### 1.2 PROSECUTION OF SURVEILLANCE WORK.

The work shall be as indicated on the Plans and as required by the Specifications. Unless otherwise indicated, the Contractor shall furnish and install all required materials and equipment, including all associated appurtenances, to produce a complete and operational installation. The appurtenances shall be as indicated, and the costs shall be included in the unit prices bid for the pay items of this contract. The work shall be done in a workmanlike manner.

### 1.3 CONNECTIONS TO EXISTING INSTALLATIONS.

Where new work connects to existing installations, the Contractor shall do all necessary cutting, fitting and foundation drilling to the existing installation and shall remove all existing work, as required, to make satisfactory connections, with the work to be performed under these Provisions, so as to leave the entire work in a finished and workmanlike manner, as approved by the Bureau of Traffic Operations Electrical Engineer. No raceways shall be allowed to enter cabinet through the sides or back walls.

Some contracted work which does not call for a complete rebuilding of a surveillance location but the replacement of detector loops and lead-in cable only in conjunction with work such as pavement overlay, cut and grind, curb and gutter replacement and other similar type work where existing appurtenances have been in place for several years. This at times has created pre-existing conditions (such as blocked/broken lead-in conduits, buried handholes) which the contractor may have to repair/replace to make the location fully functioning. The Contractor will be compensated for such work utilizing contract items after a complete inspection by the Bureau of Traffic Operations Electrical Engineer, Resident Engineer and Electrical Maintenance Contractor's Rep. with a full review on a case by case basis. Upon completing such work the Contractor shall notify the R.E. to contact the Bureau of Traffic Operations Electrical Engineer for checks and test to insure the location is on-line and working correctly.

The Contractor shall furnish all labor and material to the furtherance of this end, whether or not distinctly shown on the plans, in any of the "Standard Specifications" or in the Special Provisions.

Note that the Contractor shall be entitled to only one request for location marking of existing systems by the Electrical Maintenance Contractor and that multiple requests may only be honored at the Contractor's expense.

#### 1.4 STANDARD GUARANTEE.

Manufacturers' warranties or guarantees on all electrical and mechanical equipment consistent with those provided as customary trade practice shall be obtained and transferred to the State.

#### 1.5 IN-SERVICE WARRANTIES OR GUARANTEES.

The Contractor shall provide warranties or guarantees that will provide for satisfactory in-service operation of the mechanical and electrical equipment and related components. These warranties or guarantees shall cover a period of two (2) years following project acceptance. The cost of these warranties and guarantees shall be considered incidental to the Contract.

#### 1.6 EQUIPMENT DOCUMENTS.

The Contractor shall furnish five (5) diagrams of the internal and external connection of the equipment in each Bureau of Traffic Operations Electrical cabinet. Contractor shall also furnish the Operating and maintenance instructions for all equipment supplied. One copy of the wiring diagrams for each cabinet shall be retained in each field cabinet. A wiring diagram shall be contained in a plastic pouch that shall be permanently mounted to the door of each cabinet. Contractor shall permanently mark the cabinet for each termination and each terminal connection as to loop, tone, closure, phone, and lane function of each termination in the cabinet and provide a completed cable log and location as-built diagram at each location.

#### 1.7 TERMINAL BLOCKS.

Terminal blocks provided in field cabinets shall be the heavy duty barrier type. The terminal block shall be a minimum of 2 inches (50.8 mm) wide and 1-3/16 inch (30.16 mm) deep. Center to center of the terminal screws or studs shall be a minimum of 21/32 inch (16.67 mm) with barriers in between. Terminal blocks shall be rated at 45 amps 600 volts breakdown RMS line to line 11,000 V. and breakdown RMS line to ground 13,800 V. A marking strip shall be provided with each terminal block.

#### 1.8 EXISTING EQUIPMENT.

All existing equipment, replaced by new equipment shall remain the property of the State and shall be delivered to the Electrical Maintenance Contractor. The cost of removing and delivering the replaced equipment shall be paid for under separate pay item for Cabinet Housing Equipment - Removal.

#### 1.9 TELECOMMUNICATION CABLE.

When installing the telecommunication cable, the Contractor shall extend his installation and connections of the cable to the next adjacent Surveillance installations or junction box, beyond the limits of his contract section. He shall be responsible for insuring that the cable is continuous and connected from one contract section to the other.

The Contractor shall comply with the agreement between the State of Illinois and IBT/Ameritech as to connections, locations, and terminations of the phone lines (Telephone Company, Engineering, General Service Engineering Division, Outside Plant Engineering Notes 14-36A., March 1971, Administrative Aids and Procedures).

#### 1.10 EXISTING SURVEILLANCE EQUIPMENT AND APPURTENANCES.

Before starting work, the Contractor, in the presence of the Resident Engineer, Bureau of Traffic Operations Electrical Engineer and the State Electrical Maintenance Contractor's rep., shall inspect the existing equipment to be delivered or maintained by the Contractor and shall take an inventory of all defective, broken, and/or missing parts. Those parts found broken, defective, and/or missing shall be repaired or replaced by the State Electrical Maintenance contractor and shall be recorded as such. The Contractor shall be required to maintain all tone transmitters, tone receivers, tone power supplies, tone mounting frames, harnesses, controller and wiring. The Contractor shall be required to maintain all metering and surveillance cabinets, foundation, concrete handhole, vehicle detection equipment, all interconnecting cables and all Surveillance appurtenances including signal heads. Contractor shall number each cabinet as indicated on the plans, with reflective decals as those used on lighting pole standard.

Should damage occur to any surveillance items during the Contractor's contract period, the Contractor shall repair or replace all damaged equipment at his own expense. The Bureau of Traffic Operations Electrical Engineer shall determine what equipment shall be reusable and what shall be replaced. Replaced equipment shall be of equal or better quality and type.

The Contractor, prior to the commencement of his work, shall notify the Bureau of Traffic Operations Electrical Engineer for a pre-construction inspection. If construction begins prior to this meeting, the Contractor assumes maintenance responsibilities of the locations within his contract limits and shall make any repairs or replace any damaged equipment pre-existing or damaged as a result of his own negligence at his own expense. This also relieves the Electrical Maintenance Contractor of providing one free locate of the surveillance installations within the contract limits.

#### 1.11 AS-BUILT PLANS.

Upon completion of the work, the Contractor shall furnish one (1) copy of "as-built" drawings on CD compatible with Micro Station V8-2004 Edition software at the Bureau of Traffic Operations Electrical Design Section and four (4) full size sets of "as-built" plans to the Resident Engineer. The plans shall include definite locations and length of all cables, duct, conduit pushes, induction loop, lead-in, foundations, handhole and P-duct. The cost of the "as-built" plans shall be incidental to the contract. The Engineer will not authorize final inspection of any installations until the said plans are in his possession.

#### 1.12 PROTECTION OF THE WORK.

Electrical work, equipment and appurtenances shall be protected from damage during construction until final acceptance. Electrical raceway or duct openings, shall be capped or sealed from the entrance of water and dirt. Wiring shall be protected from mechanical injury.

#### 1.13 STANDARDS OF INSTALLATION.

Electrical work shall be installed in a neat and workmanlike manner in accordance with the best practices of the trade. Unless otherwise indicated, materials and equipment shall be installed in accordance with the manufacturer's recommendations.

Except as specified elsewhere herein, materials and equipment shall be in conformance with the requirements of Section 800 & 1088 of the Standard Specifications for Road and Bridge Construction.

In addition to the requirements of the Standard Specifications relating to control of materials, the Contractor shall comply with the following requirements.

The Contractor shall supply samples of all wire, cable, and equipment and shall make up and supply samples of each type of cable splice proposed for use in the work for the Engineer's approval.

Before equipment and/or material including cabinet, telemetry, and detectors are delivered to the job site, the Contractor shall obtain and forward to the Engineer a certified, notarized statement from the manufacturer, containing the catalog numbers of the equipment and/or material, guaranteeing that the equipment and/or material, after manufacture, comply in all respects with the requirements of the Specifications and these Special Provisions. Re-manufactured or modified equipment other than by the original manufacturer shall not be allowed. Original manufacturer shall certify that he made modification to the equipment.

All cost of work and materials required to comply with the above requirements shall be included in the pay item bid prices, under which the subject materials and equipment are paid, and no additional materials and equipment are paid, and no additional compensation will be allowed. Materials and equipment not complying with the above requirements that have been installed on the job will be done at the Contractor's own risk and may be subject to removal and disposal at the Contractor's expense.

#### 1.14 PROCUREMENT.

Materials and equipment shall be the products of established manufacturers, shall be new, and suitable for the service required. The Contractor is obligated to conduct his own search into the timely availability of the specified equipment and to ensure that all materials and equipment are in strict conformance with the contract documents. Materials or equipment items which are similar or identical shall be the product of the same manufacturer. The cost of submittals, certifications, any required samples and similar costs shall not be paid for extra but shall be included into the pay item bid price for the respective material or work.

#### 1.15 EXCEPTIONS, DEVIATIONS AND SUBSTITUTIONS.

Exceptions to and deviations from the requirements of the Contract Documents shall not be allowed without approval by Engineer and Bureau of Traffic Operations Electrical Engineer. It is the Contractor's responsibility to note any deviations from contract requirements at the time of submittal and to make any requests for deviations in writing to the Engineer. In general, substitutions will not be acceptable. Requests for substitutions must demonstrate that the proposed substitution is superior to the material or equipment required by the Contract Documents. No substitutions shall be permitted without the approval of the Engineer, and Bureau of Traffic Operations Electrical Engineer.

#### 1.16 SUBMITTALS.

Within 30 days after contract award, the Contractor shall submit, for approval, complete manufacturer's product data (for standard products and components) and detailed shop drawings (for fabricated equipment). All of the submittal information shall be assembled by the Contractor and submitted to the Engineer at one time. All equipment samples shall be submitted at this time. Partial and sporadic submittals may be returned without review. The Contractor may request, in writing, permission to make a partial submittal. The Engineer will evaluate the circumstances of the request and may accept to review such a partial submittal. However, no additional compensation or extension of time shall be allowed for extra costs or delays incurred due to partial or late submittals.

#### 1.17 TESTING.

Before final acceptance, the electrical equipment, material, induction loops and work provided under this contract shall be tested. Tests will not be made progressively, as parts of the work are completed they shall be all made at one time. Items which fail to test satisfactorily shall be repaired or replaced. Bureau of Traffic Operations Electrical Engineer will witness all testing.

#### 1.18 INSTALLATION/INSPECTION PROCEDURES.

After all control boxes and equipment to be installed has been physically inspected and approved by Bureau of Traffic Operations Electrical Engineer, the equipment supplier shall then deliver all equipment to the job site. The Contractor shall then install/safeguard all the equipment which has been delivered prior to requesting an inspection. No unapproved equipment shall be on the job site or installed as part of the job. This does not relieve the Contractor from replacement/repairs of equipment found to be damaged or in non-compliance of these provisions.

Certain items such as conduit, wire, duct, anchor bolts, and junction boxes will be inspected and may be tested by the Department's Bureau of Materials and these items shall not be delivered to the job site without inspection approval. Items such as cabinets shall be inspected by the Engineer at the contractor's or manufacturer's shop and these items shall not be delivered to the job site without Bureau of Traffic Operations Electrical Engineer inspection approval. It shall be the Contractor's responsibility to arrange inspection activities with the Engineer thirty (30) days prior to installation. 30 days prior to installation of the tone equipment being supplied and, prior to request for a turn-on, the Bureau of Traffic Operations Electrical Engineer will be contacted for the correct frequencies, controller addresses and "DB" setting for each location to be installed. When the work is complete, all equipment fully operational, the Contractor shall schedule a turn-on inspection with the Engineer. Acceptance will be made as a total system, not as parts. The Contractor shall request the inspection no less than seven (7) working days prior to the desired inspection date.

No inspection shall be made until the delivery of acceptable "as built" drawings, specified certifications, and the required guarantees.

It will be the responsibility of the installing contractor to provide a qualified technician representing the tone equipment supplier to be at the turn-on inspection of each location to provide the technical expertise to bring each location on line.

The Contractor shall furnish the necessary manpower and equipment to make the Inspection. The Engineer may designate the type of equipment required for the inspection tests.

A written record of the loop analyzer readings shall be submitted to the Bureau of Traffic Operations Electrical Engineer prior to the final inspection.

Any part or parts of the installation that are missing, broken, defective, or not functioning properly during the inspection shall be noted and shall be adjusted, repaired, or replaced as directed by the Engineer and another inspection shall be made at another date. Only upon satisfaction of all points shall the installation be acceptable.

After the subject inspections are completed the Bureau of Traffic Operations Electrical Engineer will provide the contractor with a complete punch list of items necessary to be completed prior to final inspection and acceptance for maintenance.

The Contractor shall furnish a written guarantee for all materials, equipment and work performed under the contract for a period of not less than two (2) years from the date of final acceptance.

## **OPERATION OF EXISTING TRAFFIC SURVEILLANCE/SPEED/COUNT STATIONS**

Existing traffic surveillance installations and/or any electrical facilities at certain locations 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 surveillance equipment, presently installed at these locations, is the property of the State of Illinois, Department of Transportation, Division of Highways or Springfield Bureau of Traffic.

The Contractor is further advised that the existing traffic surveillance or the existing speed/data installations must remain in operation during all construction stages except for the most essential down time or as noted in this specification. Any shutdown of the installation, for a period to exceed four (4) hours must have the prior approval of the Engineer. Such approval will generally only be granted during the period extending from 10:00 a.m. to 2:00 p.m. on weekdays. Any other traffic shutdown, either for periods in excess of one (1) hour or outside of the 10:00 a.m. to 2:00 p.m. weekday period must have prior approval of the Engineer.

The Contractor may take out of operation for the duration of the Halstead Bridge reconstruction, the following existing speed/data locations:

- The speed/data locations on EB and WB I-290 near the Halstead St. bridge.
- The speed/data location on the west end of the S-W ramp near the Halsted St. bridge.
- The speed/data location on the west end of the E-N ramp near the Halsted St. bridge.
- The speed/data location on the west end of the E-S ramp beneath Halsted St. bridge.

Each ramp has two speed/data locations. One is located near each origin and destination ramp merge points. The Contractor must maintain at least one of the two speed/data station across all lanes of traffic on the ramps at all times.

The Contractor, prior to the commencement of his work, shall notify the State's Electrical Maintenance Contractor and the Bureau of Traffic Operations of his intent to perform this work. Failure to notify either the Bureau/EMC when starting work will cause maintenance to be transferred to the Contractor without pre-inspection and will require the Contractor to complete all repairs without compensation. This also relieves the EMC from providing a locate without compensation. Upon request from the Contractor, the State Electrical Maintenance Contractor will locate any buried conduit or other electrical facility which may interfere with the Contractor's operations without charge to him. This shall in no way relieve the Contractor of his responsibility to repair and/or replace electrical facilities damaged by his operations.

Note that the Contractor shall be entitled to only one request for location marking of existing systems and that multiple requests may only be honored at the Contractor's expense.

Any known or suspected damage to the electrical facility shall be reported immediately to the Engineer. The Contractor will be held fully responsible for the repair and/or replacement of any part of the existing installation, whether permanent or temporary, if, in sole opinion of the Engineer, such damage was caused by the negligence of the Contractor, his agents, or employees. The State, at its own discretion, may call upon the State's Electrical Maintenance Contractor or the concerned bureau to make any such repairs and/or replacements at the total expense of the Contractor for this Section.

## **RADAR VEHICLE SENSING DEVICE (TSC T 418#3A)**

**1.0 General.** This item shall govern the purchase, installation, programming and transmission of data for above-ground radar vehicle sensing devices (RVSD) equivalent to the Wavetronix SmartSensor HD.

**2.0 Measured Quantities.** The RVSD shall provide volume average speed, occupancy, classification counts, 85<sup>th</sup> percentile speed, average headway, average gap, speed bin counts and direction counts for user-configurable time intervals for a minimum of 8 lanes of traffic.

The RVSD shall provide up to 8 length-based classification bins.

The RVSD shall provide up to 15 speed bins.

The RVSD shall provide speed, length, class, lane assignment, and range data for each vehicle detection.

The RVSD shall provide presence data for at least 8 lanes of traffic.

### **3.0 Detectable area.**

3.1 Detection Range. The RVSD shall be able to detect and report information in lanes located with the far boundary at a minimum of 200 ft. from the base of the pole on which the RVSD is mounted.

3.2 Barrier Performance. The RVSD shall detect vehicles with the specified accuracy in lanes that are adjacent to a barrier when 50% of a sedan is visible over the barrier from the point of view of the RVSD.

### **4.0 Performance.**

4.1 Volume Accuracy. The volume data shall be within 5% of truth for a direction of travel during nominal conditions.

4.2 Speed Accuracy. Average speed data shall be accurate to within 3 mph (5 kph) for any direction of travel when there are more than 5 cars per lane in an interval.

The RVSD shall measure speed using a dual-radar speed trap that calculates the time delay between two different radar beams.

4.3 Occupancy Accuracy. Occupancy data shall be within 10% of truth for any direction of travel on a roadway during nominal conditions.

4.4 Classification Accuracy. The RVSD shall correctly determine classification for 80% of detected vehicles when the classification bins are at least 10 ft. (3 m) wide and occupancy of all lanes is below 30%.

**5.0 Performance Maintenance.** The RVSD shall not require cleaning or adjustment to maintain performance.



The RVSD shall not rely on battery backup to store configuration information, thus eliminating any need for battery replacement.

Once the RVSD is calibrated, it shall not require recalibration to maintain performance unless the roadway configuration changes.

The designed mean time between failures (MTBF) of the RVSD, operating continuously, shall be 10 years or more.

6.0 Physical Properties. The RVSD shall not exceed 8 lbs in weight.

The RVSD shall not exceed 14 in. by 12 in. by 6 in. (35.6cm x 30.5cm x 15.2cm) in its physical dimensions.

All external parts of the RVSD shall be ultraviolet-resistant, corrosion-resistant, and protected from fungus growth and moisture deterioration.

6.1 Enclosure. The enclosure shall be classified "f1" outdoor weatherability in accordance with UL 746C.

The RVSD shall be classified as watertight according to the NEMA 250 Standard.

The RVSD enclosure shall conform to test criteria set forth in the NEMA 250 standard for type 4X enclosures. Test results shall be provided for each of the following type 4X criteria:

- External Icing (NEMA 250 clause 5.6)
- Hose-down (NEMA 250 clause 5.7)
- 4X Corrosion Protection (NEMA 250 clause 5.10)
- Gasket (NEMA 250 clause 5.14)

The RVSD enclosure shall include a connector that meets the MIL-C-26482 specification. The MIL-C-26482 connector shall provide contacts for all data and power connections.

7.0 Power Requirements. The RVSD shall consume less than 10 W.

The RVSD shall operate with a DC input between 12 VDC and 28 VDC.

8.0 Communication Ports. The RVSD shall have an RS-485 port and an RS 232 port.

The RVSD shall have contact closure pairs for each lane in order to communicate with existing locations.

The RS-232 port shall be full-duplex and shall support true RTS/CTS hardware handshaking for interfacing with various communication devices.

The RVSD shall support the upload of new firmware into the RVSD's non-volatile memory over either communication port.

The communication ports shall support all of the following baud rates: 9600, 19200, 38400, 57600, and 115200 bps.

9.0 Data Protocols. The RVSD shall support 3 different data protocols for all lanes being monitored: interval (bin) data, event (per vehicle) data, and real-time true presence data.

The interval (bin) data packet protocol shall support:

- Sensory ID
- A timestamp
- Total volumes
- Average speed values
- Occupancy in 0.1% increments
- Volume in up to 8 length-based user-defined vehicle classification bins
- Volume for both directions of traffic (bin by direction)
- 85<sup>th</sup> percentile speed in either mph or kph

The real-time true presence data packet protocol shall support

- Sensor ID
- True presence information for each lane

10.0 Data Buffering. The RVSD shall store, in non-volatile memory, at least 9,000 interval data packets.

11.0 Radar Design. The RVSD shall employ a dual radar design that includes 2 receive channels.

The RVSD shall not rely on temperatures compensation circuitry to maintain transmit frequency stability.

11.1 Antenna Design. The RVSD antennae shall be designed on printed circuit boards.

11.2 Resolution. The RVSD shall transmit a signal with a bandwidth of at least 240 MHz.

11.3 RF Channels. The RVSD shall provide at least 4 RF channels so that multiple units can be mounted in the same vicinity without causing interference between them..

12.0 Configuration.

12.1 Auto-configuration. The RVSD shall have a method for automatically defining traffic lanes or detection zones without requiring user intervention.

12.2 Manual configuration. The auto-configuration method shall not prohibit the ability of the user to manually adjust the RVSD configuration.

The RVSD shall support the configuring of lanes or detection zones in one-ft. (0.3-m) increments.

12.3 Windows Mobile–based Software. The RVSD shall include graphical user interface software that displays all configured lanes and the current traffic pattern, as well as, measured speed or length.

The graphical interface shall operate on Windows Mobile Windows 2000, windows XP and Windows Vista in the .NET framework.

- Automatically find the correct baud rate
- Operate over a TCP/IP/NTCIP connection

13.0 Operating Conditions. The RVSD shall maintain accurate performance in all weather conditions.

The RVSD shall be capable of continuous operation over an ambient temperature range of -40°F to 165.2°F (-40°C to 74°C).

The RVSD shall be capable of continuous operation over a relative humidity range of 5% to 95% (non-condensing).

#### 14.0 Testing.

14.1 FCC. Each RVSD shall be Federal Communication Commission (FCC) certified under CFR 47, Part 15, section 15.249 as an intentional radiator.

14.2 NEMA TS2-2003 Testing. The RVSD shall comply with the applicable standards stated in the NEMA TS2-2003 Standard.

15.0 Manufacturing. The internal electronics shall comply with the requirements set forth in IPC-A-610C Class 3, Acceptability of Electronic Assemblies.

16.0 Support. The RVSD manufacturer shall provide both training and technical support services.

16.1 Training. The manufacturer provided training shall be sufficient to fully train installers and operators in the installation, configuration, and use of the RVSD to ensure accurate RVSD performance.

The training shall be conducted locally.

The manufacturer provided training shall consist of comprehensive classroom labs and hands-on, in-the-field installation and configuration training.

Presentations shall be followed by hands-on labs in which trainees shall practice using the equipment to calibrate and configure a virtual RVSD. The manufacturer-provided training shall include the following items:

- Knowledgeable trainer
- Presentation materials
- Computer files
- Laptop computers

Field training shall provide each trainee with the hands-on opportunity to install and configure the RVSD at roadside

16.2 Technical Assistance. Manufacturer-provided technical support shall be available to assist with the physical installation, alignment, auto-configuration, troubleshooting, maintenance and replacement of each RVSD.

17.0 Documentation. RVSD documentation shall include a comprehensive user guide as well as an installer quick reference guide and a user quick-reference guide.

The RVSD manufacturer shall supply the following documentation and test results at the time of the bid submittal:

- Volume accuracy data, including performance analyses for:
  - Free-flowing traffic
  - Traffic with a lane roughly 8 ft (2.4m) beyond a 4-ft. (1.2m) concrete barrier
  - 6-ft. (1.8-m) and 240-ft. (73.2m) lateral offset (simultaneous)
- Speed accuracy test data for both per-vehicle and average speed
- Occupancy accuracy test data
- Vehicle classification test data
- Auto-configuration documentation
- FCC CFR 47 certification
- NEMA 250 Standard for Type 4X Enclosure third-party test data
- NEMA TS2-2003 Standard third-party test data

The RVSD shall be warranted free from material and workmanship defects for a period of 2 years from date of shipment.

18.0 Mounting and Installation.

18.1 Mounting Assembly. The RVSD shall be mounted directly onto a mounting assembly fastened to a pole or other solid structure.

The RVSD mounting assembly shall be constructed of weather-resistant materials and shall be able to support a 20-lb. (9.1 kg) load.

18.2 Mounting Location. The RVSD shall be mounted at a height that is within the manufacturer's recommended mounting heights.

The RVSD shall be mounted at an minimum offset of 6 ft. from the first lane.

Two RVSD units shall not be mounted so that they are pointed directly at each other.

A distance of 40 ft. (12.2 m) or more, along the direction of the roadway, shall separate the RVSDs if they are located on opposing sides of a roadway and the RVSDs shall be configured to operate on different RF channels.

It is recommended that the manufacturer be consulted to verify final RVSD placement if the RVSD is to be mounted near large planar surfaces (sound barrier, building, parked vehicles, etc) that run parallel to the monitored roadway.

The RVSD shall be located within sight of cabinet for set-up.

- 18.3 Cabling. The cable end connector shall meet the MIL-C-26482 specification and shall be designed to interface with the appropriate MIL-C-26482 connector.

The cable shall be the Orion Wire Combo-2207-2002-PVC-GY or equivalent.

The cable shall be terminated only on the two farthest ends of the cable.

If 12 VDC is being supplied for the RVSD then the cable length shall not exceed 110 ft. (33.5 m).

If 24 VDC is being supplied for the RVSD then the cable length shall not exceed 600 ft. (182.9 m).

A 3.5 foot (1.1m) serial cable shall be installed in control cabinet.

- 18.4 Lightning Surge Protection. The RVSD shall be installed using lightning surge protection on all communication and power lines. The surge protection devices shall meet or exceed the EN 61000-4-5 Class 4 Specification.

The lightning surge protection unit shall be the Wavetronix Click 200™ or equivalent.

The lightning surge protection shall withstand 6KV and/or 10,000A.

- 18.5 Power Supply. The RVSD shall be installed using a Click! 201, Click! 202 or an equivalent AC to DC power converter.

- 18.6 Contact Closure Module. The RVSD shall be installed with a Click! 100 or an equivalent contact closure module .

#### 19.0 Method Of Measurement.

This item shall be measured RADAR VEHICLE SENSING DEVICE, installed each, tested, operational and complete.

#### 20.0 Basis Of Payment.

This work shall consist of furnishing all labor, materials, equipment, setup, testing and training to supply and install a RADAR VEHICLE SENSING DEVICE, complete in accordance with the contract drawings and these special provisions. Miscellaneous connectors, brackets, cables (including cable from the cabinet to the RVSD) and serial port cable shall be included in the unit price.

**GROUND ROD (TSC T 420#6)**

Effective: January 1, 2008

Revised: October 9, 2008

Description. This item shall consist of furnishing, installing and connecting ground rods for the grounding of service neutral conductors and for supplementing the equipment grounding system via connection at poles or other equipment throughout the system. All materials and work shall be in accordance with Article 250 of the NEC.

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

<u>ITEM</u>	<u>ARTICLE/SECTION</u>
(a) Ground Rod	1087.01(b)
(b) Copper Ground Wire	1087.01(a)
(c) Access Well	1087.01(c)

General. All connections to ground rods, structural steel or fencing shall be made with exothermic welds. Where such connections are made to insulated conductors, the connection shall be wrapped with a least 4 layers of electrical tape extended six inches (152.4 mm) onto the conductor insulations.

Ground rods shall be driven so that the tops of the rod are 609.6 mm (24 inches) below finished grade. Where indicated, ground wells shall be included to permit access to the rod connections.

Where indicated, ground rods shall be installed through concrete foundations.

Where ground conditions, such as rock, preclude the installation of the ground rod, the ground rod may be deleted with the approval of the Engineer.

Where a ground field of “made” electrodes is provided, such as at control cabinets, the exact location of the rods shall be documented by dimensioned drawings as part of the Record Drawings.

Ground rod connection shall be made by exothermic welds. Ground wire for connection to foundation steel or as otherwise indicated shall be stranded uncoated bare copper in accordance with the applicable requirements of ASTM Designation B-3 and ASTM Designation B-8 and shall be included in this item. Unless otherwise indicated, the wire shall not be less than No. 2 AWG.

Where connections are made to epoxy coated reinforcing steel, the epoxy coating shall be sufficiently removed to facilitate the exothermic weld.

Method of Measurement. Ground rods at light poles and ground mounted light towers shall be included in this pay item and shall be counted, each. Ground wires and connection of ground rods at poles shall be included in this pay item. Ground rods installed at handholes, light tower foundations integral with retaining walls, foundations for lighting controllers, and foundations for sign structures shall not be measured for payment but shall be included in the cost of handhole or appropriate foundation pay item.

Basis of Payment. This item shall be paid at the Contract unit price each for GROUND ROD, of the diameter and length indicated which shall be payment in full for the material and work described herein.

## **GROUNDING OF ITS SUBSYSTEMS (TSC T 420#8)**

Effective: March 12, 2009

The grounding of ITS subsystems shall meet the requirements of Section 806 of the Standard Specifications. In addition, amend Article 806.03 of the Standard Specifications to include:

General. All ITS subsystems (ramp metering system, dynamic message sign system, system detector stations, etc.), associated equipment, and appurtenances shall be properly grounded in strict conformance with the NEC and as shown on the Plans.

Testing shall be according to Section 801. 13(a)(5) of the Standard Specifications:

a) The grounded conductor (neutral conductor) shall be white color-coded. This conductor shall be bonded to the equipment-grounding conductor only at the Electric Service installation. All power cables shall include one neutral conductor of the same size as the phase (hot) conductors.

b) The equipment-grounding conductor shall be green color-coded. The following is in addition to Section 801.04 of the Standard Specifications.

1.) Equipment grounding conductors shall be XLP insulated No. 6, unless otherwise noted on the Plans, and bonded to the grounded conductor (neutral conductor) only at the Electric Service Installation. The equipment-grounding conductor is paid for separately and shall be continuous. The Earth shall not be used as the equipment-grounding conductor.

2.) Equipment grounding connectors shall be bonded, using a listed grounding conductor, to all ramp meters, DMS, and detector cabinets, handholes, and other metallic enclosures throughout the ITS subsystems, except where noted herein. A listed electrical joint compound shall be applied to all conductor terminations, connector threads, and contact points.

3.) All metallic and non-metallic raceways containing ITS circuit runs shall have a continuous equipment grounding conductor, except raceways containing only detector loop lead-in circuits, circuits under 50 volts and/or fiber optic cable will not be required to include an equipment grounding conductor.

c) The grounding electrode conductor shall be similar to the equipment grounding conductor in color-coding (green) and size. The grounding electrode conductor is used to connect the ground rod to the equipment grounding conductor and is bonded to ground rods via exothermic welding, listed pressure connectors, listed clamps or other approved listed means.

Basis of Payment. Payment shall be included in the various items associated with ITS.

## **ELECTRIC CABLE NO. 19 - 6 CONDUCTORS OR 12 CONDUCTORS (TSC T 421#2)**

Effective: June 1, 1994

Revised: May 12, 2008

Description. This item shall consist of furnishing and installing telephone cable intended for direct burial in P-duct or G.S. conduit. The number of conductors shall be twisted into pairs stranded into a cable core and enclosed in two polyethylene jackets, with a copper shield between the inner and outer jackets. All No. 19 electric cable shall conform with these specifications and the current addition of the Rural Electrification Specification for fully color-coded, polyethylene or crystalline propylene/ethylene copolymer-insulated, double polyethylene copolymer-insulated, double polyethylene-jacketed telephone cables for direct burial PE 54. The No. 19 cables shall be installed in complete spans.

Material and Testing. No. 19 electric cable shall meet the requirement set forth in the REA Specification PE 54.

### Construction.

**CONDUCTORS:** Each conductor shall be a solid round wire of commercially pure annealed copper. Conductors shall meet the requirements of ASTM Designation B-3, latest issue, except that the requirements for dimensions and permissible variations are waived.

**CONDUCTOR INSULATION:** Each conductor shall be insulated with colored insulating grade high density polyethylene or crystalline propylene/ethylene copolymer. The manufacturer shall have the option of using either of the above materials.

**IDENTIFICATION OF PAIRS:** The polyethylene or propylene copolymer compounds used for conductor insulation shall be colored so as to identify (1) the "tip" and "ring" conductor of each pair, and (2) each pair in the completed cable.

**STANDARDS OF COLOR:** The colors of insulated conductors supplied in accordance with this specification shall fall within the limits of standards of color as defined by the Munsell Color Notations specified in paragraph 4.031.

**TWISTING OF PAIRS:** The insulated conductors shall be twisted into pairs.

In order to provide sufficiently high crosstalk losses at voice and carrier frequencies, the pair twists shall be designed to enable the cable to meet the pair-to-pair capacitance unbalance requirements and the crosstalk requirements.

**CORE COVERING:** The core shall consist of an inner jacket of polyethylene applied over the completed core, a metal shield, and an outer jacket of polyethylene.



**SHIELD:** A gopher-resistant corrugated shield of fully annealed copper shall be applied longitudinally over the inner jacket. The shield shall completely cover the inner jacket and shall be so constructed that the completed cable shall meet the bending requirements given in paragraph 9 of Rural Electrification Specification PE-54. The shield shall provide 100% electrical shielding plus resistance to gopher attack or other severe service conditions.

**MUTUAL CAPACITANCE:** The average mutual capacitance of all pairs in any reel shall be in accordance with the following table:

Number of Cable Pairs	Average Mutual Capacitance	
	mf/mile	(mf/km)
3	0.083 plus or minus 0.010	(0.052 plus or minus 0.006)
6, 12	0.083 plus or minus 0.007	(0.052 plus or minus 0.004)
18 or more	0.083 plus or minus 0.004	(0.052 plus or minus 0.002)

Mutual capacitance is the effective capacitance between the two wires of a pair.

**CAPACITANCE UNBALANCE: (Pair to Pair):** Pair-to-pair capacitance unbalances as measured on the completed cable at a frequency of 1000 plus or minus 100 Hz shall not exceed the following values:

Number of Cable Pairs	Pair-to-Pair Capacitance Unbalance (Max)	
	mmf/kft	(mmf/km)
Less than 12	100	(181.1)

**CAPACITANCE UNBALANCE - (Crosstalk Loss):** The r.m.s. output-to-output far-end crosstalk loss as measured on the completed cable at a frequency of 150 kHz shall be not less than 73 db per 1,000 feet (67.8 db per kilometer) for cable sizes of 6 pairs and larger. The r.m.s. calculation shall be based on the combined total of all adjacent and alternate pair combinations within the same layer and center to first layer pair combinations.

**CAPACITANCE UNBALANCE - (Pair to Shield):** Pair-to-shield direct capacitance unbalances as measured on the completed cable at a frequency of 1000 plus or minus 100 Hz shall not exceed the following values:

Cable Pairs	Pair-to-Shield Unbalance (Max)	
	mmf/kf	(mmf/km)
Less than 12	250	(820)

**CONDUCTOR RESISTANCE:** The d.c. resistance of any conductor as measured on the completed cable shall not exceed the following values when measured at or corrected to 20° C.

AWG	Maximum Resistance	
	ohms/kf	(ohms/km)
19	8.7	(28.5)

**Basis of Payment.** This work will be paid for at the contract price per lineal foot (meter) for ELECTRIC CABLE IN CONDUIT, COMMUNICATIONS, NO. 19 of the number of conductors specified, for furnishing all materials, making all electrical connection and installing the cable in place.

## **HANDHOLE (TSC T 428#1)**

Effective: June 1, 1994

Revised: May 19, 2009

Description. This item shall consist of constructing a handhole, a heavy-duty handhole, or a double handhole, cast in place, complete with frame and cover and in accordance with the following requirements and conforming in all respects to the lines, grades, and dimensions shown on the plans or as directed by the Engineer. All handholes shall be installed in accordance with the Standard Specifications Sec. 814.

Materials. All handholes shall be constructed of Class SI concrete meeting the requirements of the Standard Specifications for Road and Bridge Construction Section 1020.

Construction Details. Handhole of the type specified shall be constructed in accordance with the details shown on the plans and conform to the following requirements:

1. **Concrete:** Concrete construction shall be done in accordance with the provisions of Concrete for Structures and Incidental Construction contained in the Standard Specifications for Road and Bridge Construction Sec. 503.
2. **Placing Castings:** Castings shall be set accurately to the finished elevation so that no subsequent adjustment will be necessary. Castings shall be set flush with a sidewalk or pavement surface. When installed in an earth shoulder away from the pavement edge, the top surface of the casting shall be 1 in. (25.4mm) above the finished surface of the ground.
3. **Backfilling:** Any backfilling necessary under a pavement, shoulder, sidewalk or within 2 ft. (60 cm) of the pavement edge shall be made with sand or stone screenings.
4. **Forming:** Forms will be required for the inside face of the handhole wall, and across all trenches leading into the handholes excavation. The ends of conduits leading into the handhole shall fit into a conduit bell which shall fit tightly against the inside form and the concrete shall be carefully placed around it so as to prevent leakage.
5. **French Drain:** A french drain conforming to the dimensions shown on the plans shall be constructed in the bottom of the handhole excavation.
6. **Steel Hooks:** Each handhole shall be provided with four galvanized steel hooks of appropriate size, one on each wall of the handhole.
7. **Frame and Cover:** The outside of the cover shall contain a recessed ring Type "G" for lifting and a legend "IDOT TSC" cast-in.

8. **Cleaning:** The handhole shall be thoroughly cleaned of any accumulation of silt, debris, or foreign matter of any kind, and shall be free from such accumulations at the time of final inspection.

**Basis of Payment.** This work will be paid for at the contract unit price each for HANDHOLE or HEAVY DUTY HANDHOLE, or CONCRETE HEAVY DUTY HANDHOLE (SPECIAL), as the case may be, for all necessary excavating, backfilling, disposal of surplus material and form work, frame and cover, and furnishing all materials.

**CABINET HOUSING EQUIPMENT, MOUNTING AND SIZE AS SPECIFIED (TSC T 637#2)**

Effective: June 1, 1994      Revised: May 19, 2009

**Description.** This item shall consist of furnishing and installing cabinets of the type and size specified in place including anchor bolts, bases, pedestals, posts, fans, cable harnesses, ground rods, terminal boards, shelves, mounting hardware, and all miscellaneous items at locations as directed by the Engineer.

**Materials.** Cabinets shall be of fabricated aluminum supplied in sizes with minimum inside dimensions as listed below.

<u>TYPE</u>	<u>HEIGHT</u>	<u>WIDTH</u>	<u>DEPTH</u>	<u>THICKNESS</u>	<u>OPENING</u>
E.S.P. 1	22-1/2"	14-1/4"	9-3/4"	3/16"	18" x 11"
E.S.P. 2	36"	20"	15"	3/16"	28" x 17-1/2"
E.S.P. 3	49-1/2"	30"	17"	3/16"	38" x 27-11/2"
E.S.P. 4	55"	44"	26"	3/16"	2-1/2" x 41-1/2"
E.S.P. 1	571.5mm	362mm	248mm	4.7mm	457mm x 279mm
E.S.P. 2	914.4mm	508mm	381mm	4.7mm	711mm x 444.5mm
E.S.P. 3	1257.3mm	762mm	432mm	4.7mm	965mm x 698.5mm
E.S.P. 4	1397mm	1117.6mm	660.4mm	4.7mm	1079.5mm x 1054.1mm

Cabinets shall be watertight. Doors shall be gasketed to provide a waterproof seal. Bases shall be caulked to obtain a moisture-proof bond. All cabinet types shall have a minimum of two (2) shelves for setting detectors and other equipment on, and Type 2 Corbin brass locks or equal.

E.S.P. Type 3 and Type 4 cabinets shall be fitted with a thermostatically controlled fan. It shall be mounted at the top of the cabinet for a forced air fan system that has a screened air exhaust opening under roof overhang and no opening in top of cabinetry. The fan shall be capable of operating at 130C.F.M. (3.68m<sup>3</sup>/min) at 0.160" (4.1mm) of water static pressure.

Where the E.S.P. Type 3 cabinet is used to house equipment controlling ramp metering signals, the E.S.P. Type 3 cabinet shall have a signal load relay installed. The signal load relay shall consist of two components, a base which is mounted on the E.S.P. Type 3 cabinet wall and a locking screw. The coil of this relay shall be connected to the mark output of the signal change tone receiver. The one set contacts of the load relay shall be used to change the ramp signals and one set of contacts shall be used to key the mark input to the signal change transmitter. This relay shall be incidental to the cost of the cabinet when used.

Materials shall conform to controller cabinets as listed in the Standard Specifications 1074.03 except that the door shall not have any outside designation nor shall the cabinet door be equipped with a police door or louvers. Post top mounted cabinets, shall have a ¼" (6.4mm) bottom of cabinet welded.

Each Induction loop shall have lightning protection. The Contractor shall furnish and install stud-mounted lightning protection devices. The device shall have three-terminals, two of which are connected across the loop input of the detector for differential mode protection and the third terminal grounded to protect against common mode damage. Differential mode surge shall be clamped by the semi-conductor array instantly and common mode surge shall be handled by three element gas discharge tube which fires at 400VDC and thereafter clamps the two loop leads to 30 volts in respect to ground. The device shall be installed in close proximity to the loop input. Extension of the factory leads of the device shall not be allowed.

Installation Details. Installation shall conform to applicable portions of Section 863 of the Standard Specifications.

Cabinets, cabinet posts, and cabinet pedestals shall be primed and painted in accordance with TSC Specification T712#1. The final coat color shall be specified by the T.S.C. at the time of the pre-construction meeting. Interior of all cabinets shall be painted high gloss white.

CMS/DMS Type 4 cabinets shall be serviced by 117 volts AC power with a 60 amp circuit breaker minimum.

All cabinets shall be serviced by 117 volts AC power and a telecommunication system. Each cabinet shall be equipped with a 10 ampere circuit breaker, ground rod, 115 VAC RFI filtering surge protector (ACD-340 surrestor), 130 volt, 70 joules, 10 amp varistor, lightning protection for each loop (SRA-6LC surrestor), data line protection for each leg of the four (4) wire telecommunication system (SRA 64C surrestor), a pull chain porcelain base light fixture with a 3 prong 110 volt outlet. The porcelain fixture shall be mounted on metal plate, that shall be mounted on the cabinet ceiling. No holes shall be drilled thru the cabinet exterior for internal equipment mounting.

Each wire entering a cabinet shall be trained in a workmanlike manner and lugged at each terminal strip or switch. If more than one wire has a common terminal on a terminal strip, the adjacent strip shall be used and an appropriate jumpered connection shall be made.

All cables and wiring entering a cabinet shall be dressed, harnessed, tied, laced, and clamped to produce a workmanlike wiring installation.

All cables (loop wires, power, phone) shall be labeled with a panduit type cable tag. The tag will identify the type of cable and the cable destination.

A copper grounding bus shall be mounted on the rear wall of the cabinets.

Each cabinet shall contain a wiring diagram of the installation in addition to the diagrams which are to be submitted to the Engineer.

Prior to the wiring of the cabinet, the contractor shall submit box print for approval before cabinet wiring shall begin.

The Contractor shall furnish three (3) diagrams of the internal and external connections of the equipment in each Traffic Systems Center cabinet. He shall also furnish the operating and maintenance instructions for all equipment supplied. One copy of the wiring diagrams for each cabinet shall be retained in each field cabinet. Wiring diagram shall be contained in a plastic pouch that shall be permanently mounted to the door of each cabinet. Contractor shall permanently mark the cabinet for each termination and each terminal connection as to loop, tone, closure, phone, and lane function of each termination in the cabinet.

Incidental to the cost of each cabinet, the Contractor shall construct 5" (127mm) P.C.C. sidewalk of a rectangular area 3' x 4' (1 meter by 1.2m) immediately adjacent to the cabinet foundation on the same side of the foundation as the cabinet door, with the 4' (1.2m) dimension of the rectangle parallel to the cabinet door when closed. If the width of the required cabinet foundation is greater than the 3 feet (1 meter) width of the standard concrete foundation. Type D, the 4' (1.2m) dimension of the sidewalk area shall be increased to equal the width of the foundation plus 1ft (30 cm), the area to extend 6" (15cm) beyond each side of the foundation. This paragraph shall be applicable at all cabinet locations included in this Section. The only situations where this paragraph shall not apply are as follows: When the foundation is immediately adjacent to or within a paved sidewalk or shoulder area and no further surfacing is required. The Engineer shall be the sole judge as to the applicability of this paragraph in all questions arising therefrom.

No raceways shall be allowed to enter cabinet through the sides, top or back walls.

Anchor bolts shall be installed for pedestal and base mounted cabinets. These shall be considered as incidental to the cost of the cabinets.

Cable harnesses, terminal boards, and mounting hardware shall be installed as needed. These items shall be considered as incidental to the cost of the contract.

Terminal blocks provided in field cabinets shall be the heavy duty barrier type. The terminal block shall be a minimum of 2" (50.8mm) wide and 1-3/16" (30.2mm) deep. Center to center of the terminal screws or studs shall be a minimum of 21/32" (16 mm) with barriers in-between. Terminal blocks shall be rated at 45 amps 600 volts breakdown RMS line to line 11,000 V. and breakdown RMS line to ground 13,800 V. A marking strip shall be provided with each terminal block.

Method of Measurement. Cabinets will be accepted as concrete foundation mounted, pole mounted, pedestal mounted, or attached to structure. Each cabinet installed complete and in place will be counted as a single unit.

Basis of Payment. This work will be paid for at the contract price each for CABINET HOUSING EQUIPMENT, mounting and size specified, installed complete and in place.

**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. The material specifications within this section apply only to the Chicago Department of Transportation (CDOT) Specifications which reference them.

<i>Document</i>	<i>Pages</i>
<b>SPECIFICATION NO. 1351, POLE WIRE</b> revised June 7, 2006, City of Chicago, Department of Electrical Operations .....	4
<b>SPECIFICATION NO. 1385, PEDESTAL WITH BASE: ALUMINUM, FOR TRAFFIC SIGNALS</b> revised September 16, 2010, City of Chicago, Department of Electrical Operations.....	3
<b>SPECIFICATION NO. 1407, POLE MOUNTED CAST ALUMINUM JUNCTION BOX FOR TRAFFIC SIGNALS</b> revised April 2, 2009 City of Chicago, Department of Electrical Operations.....	3
<b>SPECIFICATION NO. 1432, SELF SUPPORTING SECONDARY CABLE</b> revised July 31, 2006 City of Chicago, Department of Electrical Operations.....	6
<b>SPECIFICATION NO. 1443, SECONDARY RACK, 2 OR 3 WIRE, WITH INSULATORS</b> revised July 11, 2006 City of Chicago, Department of Electrical Operations.....	2
<b>SPECIFICATION NO. 1447, POLE: ANCHOR BASE, 3 AND 7 GAUGE, TAPERED TUBULAR STEEL, WITH HANDHOLE ENTRY</b> revised March 20, 2007 City of Chicago, Department of Electrical Operations .....	8
<b>SPECIFICATION NO. 1450, MAST ARMS: 4 , 8 , 12 , AND 15 FOOT: STEEL</b> revised April 20, 2007 City of Chicago, Department of Electrical Operations.....	5
<b>SPECIFICATION NO. 1454, MAST ARM: TRAFFIC SIGNAL MONO-TUBE</b> revised April 20, 2007 City of Chicago, Department of Electrical Operations.....	5
<b>SPECIFICATION NO. 1457, CABLE: SERVICE ENTRANCE, THREE INSULATED CONDUCTORS IN ONE OVERALL JACKET, 600 VOLT</b> revised August 3, 2006 City of Chicago, Department of Electrical Operations.....	5

**SPECIFICATION NO. 1458, ELECTRICAL MANHOLE FRAMES AND COVERS 24 INCH AND 30 INCH DIAMETER**  
 revised July 10, 2006 City of Chicago, Department of Electrical Operations..... 2

**SPECIFICATION NO. 1462, RIGID STEEL CONDUIT (HOT DIPPED GALVANIZED)**  
 revised August 3, 2006, City of Chicago, Department of Electrical Operations ..... 7

**SPECIFICATION NO. 1463, TRAFFIC SIGNAL MOUNTING BRACKETS FOR MONOTUBE ARMS**  
 revised June 22, 2001 City of Chicago, Department of Electrical Operations ..... 2

**SPECIFICATION NO. 1465, GROUND RODS**  
 revised July 12, 2006 City of Chicago, Department of Electrical Operations..... 2

**SPECIFICATION NO. 1467, ROD: ANCHOR, STEEL, WITH HARDWARE**  
 dated May 12, 1993 City of Chicago, Department of Electrical Operations ..... 2

**SPECIFICATION NO. 1475, CORD: TRAFFIC SIGNAL, EIGHT CONDUCTOR NO. 16 AWG, 600 VOLT**  
 revised September 26, 2006 City of Chicago, Department of Electrical Operations..... 4

**SPECIFICATION NO. 1493, TRAFFIC SIGNAL: VEHICULAR, TWELVE-INCH SINGLE FACE, SINGLE OR MULTIPLE-SECTION, POLYCARBONATE, LED OR INCANDESCENT**  
 revised January 27, 2010 City of Chicago, Department of Electrical Operations ..... 7

**SPECIFICATION NO. 1494, PEDESTRIAN TRAFFIC SIGNAL, 16 INCH WITH SYMBOLIC LED WALK/DON'T WALK LENSES POLYCARBONATE HOUSING**  
 revised January 27, 2010 City of Chicago, Department of Electrical Operations ..... 5

**SPECIFICATION NO. 1495, TRAFFIC SIGNAL MOUNTING BRACKET POLYCARBONATE, SIDE OF POLE**  
 dated March 20, 2000 City of Chicago, Department of Electrical Operations..... 3

**SPECIFICATION NO. 1500, TEARDROP LUMINAIRE, HORIZONTAL LAMP, FOR CHICAGO 2000 POLE; 250/310 WATT HIGH PRESSURE SODIUM LAMP; I.E.S. TYPE III DISTRIBUTION**  
 revised September 19, 2001 City of Chicago, Department of Electrical Operations..... 14

**SPECIFICATION NO. 1505, CHICAGO 2000 LIGHT POLE: ANCHOR BASE, 32'-6", 7 GAUGE FLUTED, TAPERED STEEL FOR 15" BOLT CIRCLE**  
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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**

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**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  $75^{\circ} \pm 1^{\circ} \text{C}$ , 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  $70^{\circ} \text{C}$  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.

**ELECTRICAL SPECIFICATION 1385  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
REVISED SEPTEMBER 16, 2010**

**PEDESTAL WITH BASE: ALUMINUM, FOR TRAFFIC SIGNALS**

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**SUBJECT**

1. The specification states the requirements of an aluminum pedestal and base with handhole and door for supporting a traffic signal.

**GENERAL**

2. (a) Specifications. The pedestal base shall conform to the requirements herein stated, to the specifications and methods of test of the American Society for Testing and Materials (ASTM), to the requirements of the Society of Protective Coatings (SSPC), and to the requirements of the American Welding Society (AWS), of which the most recently published revisions will govern.
- (b) Acceptance. Pedestal bases not conforming to this specification will not be accepted.
- (c) Drawing. The drawing mentioned herein is a drawing of the Department of Transportation. It is an integral part of this specification cooperating to state the necessary requirements.
- (d) Workmanship. All pedestal bases must be free of casting flaws and must have neat, smooth exterior surfaces. All holes must be accurately located and drilled. The bottom surface of the base must be ground smooth.
- (e) Sample. One complete pedestal of the manufacture intended to be furnished must be submitted within fifteen (15) business days upon receipt of a request from the Chief Procurement Officer.

- (f) Warranty. The manufacturer shall warrant the performance and construction of the traffic pedestal to meet the requirements of this specification and shall warrant all parts, components, and appurtenances against defects due to design, workmanship, or material developing within a period of five years after the traffic pedestals have been delivered. This will be interpreted particularly to mean structural or mechanical failure of any element or weld, or failure of any portion of the painting system. The warranty must be furnished in writing guaranteeing material replacement including shipment, free of charge to the City. The Commissioner will be the sole judge in determining which replacements are to be made and the Commissioner's decision will be final.

### **DETAIL REQUIREMENTS**

3. (a) Design. The pedestal base must conform to the design shown on Drawing Number 526. All bases must be of the same dimensions, and all doors must be interchangeable.
- (b) Base. The base must be cast of aluminum alloy 319 meeting the requirements of ASTM B26 with a minimum wall thickness of 9/32". The handhole opening must have a recessed lip along the entire length of both sides and the bottom such that with the door in place the exterior surface of the door is flush with the exterior surface of the base. The door must have the same curvature as the base. The door must be locked in place by means of two fingers located on its top edge which bear against the inside surface of the base, and a stainless steel Allen head locking screw which fastens to the base. The locking screw must be protected by a C-shaped drip edge protruding approximately 5/8" and concentrically encircling the screw head. The clearance between the inner surface of the drip edge and the outer surface of the screw head must be no greater than 1/8". The drip edge must encircle the screw head by a minimum of 300° with the opening in the drip edge centered at the bottom of the screw head. A continuous pipe stop must be integrally cast along the inside of the base 2.5" below the top edge.
- (c) Pedestal. The pedestal must be aluminum-alloy extruded round tube conforming to the requirements of ASTM B221, alloy 6063-T6. The aluminum pedestal must be flash anodized in accordance with Aluminum Association designation C22A21 or Alcoa designation 202-R1. Its outside diameter must be 5.563"; its wall thickness must be not less than 0.187", and its length must be as required to furnish the overall height specified in the order. The round tube must be inserted not less than two and one-half inches (2.5") into the base and welded with four (4) butt welds each not less than one (1) inch long on the inside and a continuous seam weld around the outside. Aluminum alloy pipe in lieu of aluminum alloy tube is acceptable.

- (d) The pedestal cap must be of the same cast aluminum as the base. The pedestal cap shall be essentially conical with a globe-shaped upper-end and having a minimum wall thickness throughout of not less than 1/4 inch. The cone portion must meet the skirted portion of the top in a smooth filet. The skirt must enclose the top 7/8" inches of the pedestal. Three stainless steel, or other similar approved material, set screws not less than 3/4 inches long must be equally spaced in tapped holes around the skirt and must hold the cap securely in place atop the pedestal. The set screw size must be 5/16 – 18 hex head.
- (e) Welding. The welds shall be made by the inert gas metal welding process. Filler wire shall conform to chemical composition requirements of AWS Alloy Number A5.10-69.

#### **ANODIZED FINISH**

- 4. (a) All aluminum parts shall be anodized. The result will be a gloss black appearance.
- (b) Surface preparation. All aluminum parts, including the base and pedestal shaft, must be prepared by solvent cleaning per SSPC – SP 1 (Surface Preparation Specification 1). The solvent used shall be recommended for aluminum surfaces. The solvent shall be used according to the manufacturer's instructions to remove all oil, grease, dirt, and contaminants.
- (c) Etching. All aluminum parts must be etched with sodium hydroxide or by another approved medium.
- (d) Anodizing. All aluminum parts must be anodized according to specification MIL-A-8625F Type II or III, Class II. The result must be a gloss black finish.
- (e) Sealing. All aluminum parts must be sealed in boiling water or another approved method.

#### **PACKING**

- 5. Each pedestal shall be individually wrapped to prevent damage to the surface. Each pedestal shall be suitably packed or blocked to prevent damage during shipment and handling.

**ELECTRICAL SPECIFICATION 1407  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO**

**REVISED APRIL 2, 2009**

**POLE MOUNTED CAST ALUMINUM JUNCTION BOX FOR TRAFFIC SIGNALS**

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**SCOPE**

1. This specification states the requirements for pole mounted, cast aluminum junction boxes, with terminal strips, to be used for traffic signal multiple cable terminations.

**GENERAL**

2. (a) Specifications. The junction boxes shall conform in detail to the requirements herein stated, and to the specifications and methods of test of the American Society for Testing and Materials cited by ASTM Designation Number, of which the most recently published revisions will govern. The terminal strip shall meet the applicable sections of NEMA ICS 4-2005, as well as the requirements herein stated.
- (b) Drawing. The drawing mentioned herein is a drawing of the Department of Transportation, and will be interpreted as part of these specifications.
- (c) Acceptance. Junction boxes not conforming to this specification will not be accepted.
- (d) Sample. One complete junction box with terminal strip of the manufacture intended to be furnished shall be submitted within fifteen (15) business days after receipt of a request from the Chief Procurement Officer. The box must be delivered to the Division of Electrical Operations at 2451 South Ashland.
- (e) Workmanship. All junction boxes shall be free of casting flaws and must have neat, smooth exterior surfaces. All holes must be accurately located and drilled to ensure interchangeability of all components.

**DESIGN**

3. (a) Drawing. The junction box must conform in detail to the dimensions and requirements shown on Drawing Number 954.
- (b) Material. The body door and plate must be castings of non-heat treated aluminum silicon alloy conforming to ANSI alloy 443.0 of ASTM B26.



## **DETAIL REQUIREMENTS**

4. (a) Assembly. Each junction box shall consist of the body, door with its gasket, two cast elbows with gaskets at either end of the box, terminal block mounting bracket, and terminal strip on channel mounted to bracket. All must be completely assembled, painted and ready for installation. A flat plate with gasket shall also be provided so that the City can use the junction box with only one elbow if desired.
- (b) Body. The body shall be cast as shown in Drawing Number 954. The top and bottom sides of the box where flat plates, or other fittings, will be attached, must be identically cast, machined flat, and drilled and tapped in accordance with dimensions shown. All fittings which fit on the top side must fit on the bottom side.
- (c) Door. The door shall be cast as shown in Drawing Number 954. The door must be hinged at the left with stainless steel hinge pins and must open not less than 180° to permit complete access to the interior of the junction box. Two stainless steel Allen head machine screws, undercut and held captive, shall hold the door closed and maintain positive pressure against a sponge neoprene gasket cemented in place completely around the door jamb. The door shall be finished and painted prior to cementing the gasket into its groove in the door.
- (d) Elbow sweep. Two elbows must be provided for cable entry and exit into the box. The elbows shall be cast of the same alloy as the box. The dimensions will be as indicated on Standard Drawing 954.
- (e) End Plate. A flat end plate shall be furnished with each body casting. The plate must be drilled to align with tapped holes in the body casting and have a flush match with the periphery of the top and bottom body casting pads. The plate must have a properly fitted gasket.
- (f) Gaskets. The gasketing between the body and the door shall be of sponge neoprene and must be cemented in place after painting of the door. A cork gasket, 1/8 inch thick, shall be used between the elbow or end plate and the body of the junction box on the top end and bottom end and held in place by four (4) stainless steel screws.
- (g) Mounting Bracket. A terminal block mounting bracket, as shown on Drawing Number 954, shall be furnished and installed in each junction box. The bracket must be cast from ANSI alloy 443.0 per ASTM B26.
- (h) Terminal Strip. The terminal strip will consist of modular blocks. Each block will consist of two terminals to handle one circuit. The strip will consist of twenty blocks to handle twenty circuits. The terminal strip will be mounted to an aluminum channel. The channel will have pre-punched holes for mounting to the junction box. The channel will be mounted to the box with two #10 screws.

Each block housing shall be constructed of nylon, polypropylene, or another approved material of equal properties. The bottom of the block housing will be dovetailed to fit into the aluminum channel. Overall dimensions of each block will be approximately 1.2 inches wide by 1.5 inches high. Center-to-center spacing between contacts (blocks) must be at least .375 inches.

The terminals shall accommodate AWG wire sizes 8 to 22. The contact type will be tubular clamp, with electroplated tubular copper contact. The screw type will be a steel electroplated number 10-32, slotted pan head. The terminals will be rated at 30 amps and 600 volts.

Maximum service temperature for the terminal strip will be 150° Celsius. The flammability rating must meet UL 94V-0.

- (i) Hardware. The hinge pins and all screws required for assembly of this junction box must be of stainless steel.
- (j) Painting. The exterior surfaces of the junction box shall be properly cleaned and given one (1) coat of zinc chromate primer containing ten percent (10%) iron oxide and one (1) coat of enamel. The color of the enamel must be gloss black or as ordered. A color sample must be submitted and approved before manufacturing commences. The primer and enamel shall be of an approved grade and quality.
- (k) Packing. After the paint is completely dry, and the junction boxes have been assembled, they shall be suitably packed to prevent damage to painted surfaces during shipping and handling. All shipments must be fastened to, and shipped on, 48" x 48" hardwood, 4 way, non-returnable pallets. Total height must not exceed 64" and total weight must not exceed 2,000 pounds.

**ELECTRICAL SPECIFICATION 1432  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO**

**REVISED JULY 31, 2006**

**SELF-SUPPORTING SECONDARY CABLE**

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**SCOPE**

1. This specification describes preassembled, reverse twist, secondary cable consisting of one (1) bare conductor used as a messenger and neutral in combination with two (2) or three (3) cross-linked polyethylene covered, stranded, copper conductors. Cable will be used on distribution circuits operated at a maximum voltage to ground of 600 volts.

**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 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 use within one (1) year after the date of installation. The manufacturer will be responsible for providing the footage of cable necessary to replace the failed cable length( without splices).

### **CABLE**

3. (a) The cable must meet the requirements of ICEA Specification S-76-474 for neutral supported power cable assemblies rated for 600 Volts. Each insulated conductor must be listed with UL as Type RHW-2 or Type USE-2, and must meet the NEC's requirements for these types of cable up to 90° Centigrade in wet or dry conditions.
- (b) Messenger. The messenger must be bare hard drawn, copper wire meeting the requirements of ASTM B1.
- (c) Covered Conductors. The covered conductors must be stranded, soft drawn, copper meeting the requirements of ASTM B3.
- (d) Lay. The lay of the stranded conductors must meet the requirements of ASTM B8, Class B.
- (e) Joints. No welds are permitted in the messenger. The stranded conductors may be welded, but a welding in one strand shall be at least fifty feet (50') from any other weld in the same wire or any other wire in the conductor.
- (f) Separator. A separator of mylar tape under the insulation, or other equivalent material, shall be provided. The conductor covering shall be of such consistency that linemen will be able to cut and strip the covering with normally used line tools. Any conductor received which does not meet the cutting and stripping requirements will be returned at the supplier's expense.
- (f) Insulation. The insulation must be black cross-linked polyethylene in accordance with the physical and electrical requirements detailed herein, and determined by the test procedures of ASTM D-470, except as otherwise specified. The outside diameter of the insulating covering must be circular and extruded concentrically over the conductor. It must have an average thickness as shown in these specifications, and a minimum thickness of not less than 95% of the average.

**PHYSICAL AND ELECTRICAL PROPERTIES**

4. (a) Physical Properties - Initial Value.

- |    |                       |               |
|----|-----------------------|---------------|
| 1. | Tensile Strength      | 1800 psi min, |
| 2. | Elongation at Rupture | 350% min.     |

(b) Physical Properties - After Aging.

After oven exposure at  $121^{\circ} \pm 1^{\circ}\text{C}$  for 168 hours:

- |    |   |    |
|----|---|----|
| 1. | Tensile strength, min%<br>of unaged value       | 80 |
| 2. | Elongation, min % of<br>unaged value at rupture | 80 |

(c) Moisture Resistance. When tested in accordance with the procedure given in ASTM D-470, except that the water must be maintained at  $75^{\circ}\text{C} \pm 1^{\circ}\text{C}$ , the insulation must meet the following moisture resistance requirements:

- |    |  |     |
|----|--|-----|
| 1. | Gravimetric Method:                                  |     |
|    | Water absorption, maximum<br>(Mg. per sq. in)        | 5.0 |
| 2. | Electrical Method:                                   |     |
|    | Specific inductive capacitance-<br>one day (Max.)    | 4.0 |
|    | Percent (%) change in SIC:                           |     |
|    | 1 - 14 days (Max.)                                   | 3.0 |
|    | 7 - 14 days (Max.)                                   | 2.0 |
|    | Percent (%) change in Power<br>Factor - 1 day (Max.) | 1.5 |
|    | Stability Factor (Max.)                              | 1.0 |

(d) Electrical Characteristics:

1. Dielectric Strength. Each length of insulated conductor must withstand an alternating current potential as shown in Table I for an exposure period of five (5) minutes when tested in accordance with ASTM D-470.
2. Insulation Resistance. The insulation resistance of the insulated conductor must not be less than that corresponding to a constant of 25,000 at 15.6°C (60°F).

- (e) Cold Bend Test Requirement. The insulated conductor must pass the "Cold-Bend, Long-Time Voltage Test on Short Specimens" of ASTM D-470 except that the test must be at minus 55°C.

**CABLE ASSEMBLY**

5. (a) Cabling. The insulated conductors must be reverse twisted about the messenger one (1) to one and one quarter (1-1/4) revolutions in each direction so that each conductor occupies all of the positions on the periphery of the circle periodically with an approximate distance between reversals of four feet (4').
- (b) Binding of Cable. The insulated conductors shall be bound to the messenger without fillers. The binder wire or tape shall have sufficient strength to support the assembly, but in no case will it be smaller than a #10 AWG equivalent. The binder shall be flat without sharp edges. Its strength shall be suitable for installation by the use of stringing blocks and must not itself tear, nor cut, or otherwise damage the conductor insulation. The binder wire must be applied with a left hand lay of five and one-half inches (5-1/2")  $\pm$  one half inch (1/2").

**SIZE OF SECONDARY CABLE**

6. The size and number of the individual conductors (including the bare messenger) in the secondary cable must be as follows:

<u>No. of Conductors</u>	<u>AWG Size</u>	<u>Insulation Thickness (in.)</u>	<u>Reel Length (ft.)</u>
3	#6	0.060	2,800
3	#4	0.060	2,700
3	#2	0.060	1,700
4	#6	0.060	2,000
4	#4	0.060	1,700
4	#2	0.060	1,400

All the above conductors must be seven (7) strand. All stranding to be standard round or compressed only. Compacted stranding will not be acceptable.

**TESTING**

7. (a) General. Tests shall be performed on insulation 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 Division of Engineering, shall apply. Included in these tests will be a 70,000 BTU per hour flame test in accordance with IEEE 383. All tests shall be conducted on cable produced for this order.
  
- (b) Number of Tests. Insulation tests shall be conducted on samples taken every 25,000 feet or fraction thereof of each conductor size. In no case will samples be taken closer than 15,000 feet apart.
  
- (c) Test Reports. No cable may be shipped until certified copies of all factory tests have been reviewed and approved by the engineer.
  
- (d) Acceptance. Where the cable fails to conform to any of the tests specified herein, the following will apply:
  1. Insulation or Jacket Tests. 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.
  
  2. Completed Cable (Reel) Tests. Any reel which fails to conform to testing will be rejected.
  
3. Where five percent (5%) or more of the reels are rejected for any reason, the entire cable order will be rejected.

## **PACKING AND SHIPPING**

8. (a) **Reels.** The cables must be shipped on non-returnable reels which shall be capable of withstanding, without damage, shipping, outside storage and handling during installation. "City of Chicago" shall be clearly printed on one (1) outside reel flange, and the insulated conductors on the beginning end shall not protrude beyond the reel flange. The bare neutral shall be securely stapled on the outside of the flange. The dimension of the reel flange must not be larger than thirty-eight inches (38") in diameter, the drum sixteen inches (16"0) in diameter, and eighteen inches (18") inside traverse. If reels are to be shipped on flange side, they must have two inch (2") spacers separating them for accessibility to fork lift trucks.
- (b) **Length.** The cable must be shipped in lengths shown above with a zero plus (+) tolerance and a ten percent (10%) minus (-) tolerance. Lengths shorter than minus ten percent (-10%) must not be shipped as they will not be accepted.

## **IDENTIFICATION**

9. (a) **Cable Identification.** The cable must be identified by a permanently inscribed legend on each insulated conductor in white lettering. The legend must have the following information at a minimum: conductor size(AWG), 600V, XLPE, 90°, RHW-2 or USE-2, manufacturer's name, date of manufacturer, and phase number. All markings must be a minimum of one-eighth inch (1/8") in height. Marking shall be at approximately two (2) foot intervals.
- (b) **Phase Conductor Identification.** On the three conductor cable, indelible markings reading "1" and "2" must be imprinted on each phase conductor respectively. On the four conductor cable, "3" must be imprinted on the additional conductor with the phase identification on the other phase conductors to remain the same.
- (c) **Reel Marking.** Each reel must be tagged on both the inside and outside of one reel flange with the following information which must be indelibly imprinted on a 2" x 4" brass tag: Purchaser's name and address, wire description, Purchase, or Contract, order number, size designation, net length, manufacturer's name, date of manufacture and gross weight.



**ELECTRICAL SPECIFICATION 1443  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO**

**REVISED JULY 11, 2006**

**SECONDARY RACK, 2 OR 3 WIRE, WITH INSULATORS**

---

**SUBJECT**

1. This specification covers the requirements for 2 and 3 wire secondary racks complete with insulators for attachment to street lighting poles for the purpose of supporting aerial circuit wires.

**GENERAL**

2. (a) Specifications. Each 2 or 3 wire secondary rack shall conform in detail to the requirements herein stated, and to the specifications of the American Society for Testing and Materials, cited by ASTM Designation number, of which the most recently published revision will govern. Secondary racks not conforming to this specification will not be accepted.
- (b) Sample. If requested, each bidder shall submit with his proposal one complete sample secondary rack with insulators for approval by the Commissioner. The sample must be submitted within fifteen (15) business days of such request from the Chief Procurement Officer.
- (c) Warranty. Secondary rack and pole clamps furnished under this specification shall be warranted against failure from defects due to materials or workmanship for a period of one year after delivery. In the event of failure of any of the components, the manufacturer will replace the rack, at no cost to the City.

**SECONDARY RACK**

3. (a) General Design. The secondary rack shall be the medium duty type with extended back. It shall be suitable for either 2 or 3 wire, as indicated in the bid proposal, with 8-inch spacing between centers of the clevises.

- (b) Back Section. The back section of the secondary rack must be made from hot-wrought merchant quality carbon steel 1/8 inch thick. The steel must conform with ASTM Specification A 575, Grade M1010. The back must be formed to the shape of an inverted trough, the flat portion of which must be approximately 1-1/4 inches in width. Mounting slots, 11/16 inch by 1-1/4 inch, must be longitudinally centered on the flat of the back section and located so as to coincide with the centers of the clevises, with additional slots provided at the top and bottom. The 2-wire back must be at least 18 inches in length. The 3-wire back must be at least 24 inches in length.
- (c) Clevises. Clevises must be made from 1/8 inch thick steel strip of the same material as the back section, and so formed to fit the back snugly. The prongs of the clevis must be approximately 4 inches apart and formed to the shape of an inverted trough, the flat portion of which must be approximately 3/4 inch in width with the edges pitched at an angle of 30° with the flat portion. Each clevis shall be fabricated in such a manner that the pitched edges of both prongs must slope in the same direction. The clevises must be riveted to the back section with two (2) 5/16 inch steel rivets.
- (d) Rack Bolt. The rack bolt must be a 9/16 inch diameter button head bolt made of hot-wrought carbon steel conforming with the requirements of ASTM Specification A 576, Grade 1040, complete with a 1/4 inch by 2 inch brass cotter pin at the bottom end. Centerline of the rack bolt must be located 4 inches out from the face of the back section.
- (e) Spool Insulators. Spool insulators must be electrical grade white or gray glazed porcelain.
- (f) After fabrication, the secondary rack, clevises, and all steel hardware must be hot dip galvanized according to ASTM 123. Bolts, washers, and nuts must be hot dipped galvanized according to ASTM 153.

## **TESTS**

4. At the discretion of the Commissioner, secondary racks furnished under this specification will be subject to testing to determine compliance with the strength requirements of ANSI medium type secondary racks.

**ELECTRICAL SPECIFICATION 1447  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
REVISED MARCH 20 , 2007**

**POLE: ANCHOR BASE, 3 AND 7 GAUGE, TAPERED TUBULAR STEEL, WITH  
HANDHOLE ENTRY**

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**SUBJECT**

1. This specification states the requirements for tapered, tubular, 3 gauge and 7 gauge steel anchor base poles with mast arm supports. They will support street light luminaires and/or traffic signal mast arms and will be served by underground cables.

**GENERAL**

2. (a) Specifications. The poles shall conform in detail to the requirements herein stated, and to the 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 shall submit with their bids detailed scale drawings of the mast showing actual dimensions, details, and welds. Shop drawings must be original engineering drawings created by the manufacturer. The drawings must show every dimension necessary to show how all parts will fit each other and be properly held in assembly. These drawings must also be submitted in electronic format, preferably Microstation 95, if so requested by the City.
- (d) Drawings. The drawings mentioned herein are drawings of the Department of Transportation being an integral part of this specification cooperating to state necessary requirements.
- (e) Sample. If requested by the Chief Procurement Officer, one completely assembled anchor-base pole of the manufacture intended to be furnished, must be submitted for review within fifteen (15) business days of receiving the request.

- (f) Warranty. The manufacturer shall warrant the performance and construction of the light poles to meet the requirements of this Specification and must warrant all parts, components, and appurtenances against defects due to design, workmanship, or material developing within a period of five years after the light poles have been delivered. This will be interpreted particularly to mean structural or mechanical failure of any element or weld, or failure of any portion of the painting system. The warranty must be furnished in writing guaranteeing material replacement including shipment, free of charge to the City. The Commissioner will be the sole judge in determining which replacements are to be made and the Commissioner's decision will be final.

### **STANDARDS**

3. (a) Assembly. Each anchor base pole shall consist of a steel mast with handhole entry, entry door with machine screws, grounding nut, mast base plate, top cap for mast, two (2) mast arm supports, bolt covers, and all necessary hardware required for complete assembly of these parts, ready for assembly, without special tools.
- (b) Interchangeability. Members of each pole type shall be mutually interchangeable for assembly, so that no reworking will be required to make any member fit properly in the place of any other similar member of any other similar pole.
- (c) Design. Each pole type shall conform in design and dimensions to the pertinent drawing(s) listed in Table "A".

### **MASTS**

4. (a) Mast Size. The outside diameters of the mast of each pole type shall be as listed in Table A. The mast must be tapered at 0.14 inches per foot.
- (b) Material. The mast must be fabricated from one length of No. 3, No. 7, or No. 11 Standard gauge steel meeting the material requirements of ASTM A606 for low alloy high strength coil steel, which, after fabrication, must possess an ultimate tensile strength of not less than 70,000 psi and a yield strength of not less than 60,000 psi, in accordance with ASTM A595, Grade C. Chemistry of the steel must be such as to insure resistance to atmospheric corrosion superior to that of ordinary copper bearing steel. Material certification is required. Manufacturer's steel meeting the specified physical and chemical requirements, and approved by the Commissioner, will be accepted.

- (c) Fabrication. The mast must be fabricated with not more than one (1) longitudinal weld. The weld shall be ground smooth so that it is virtually invisible. There shall be no lateral welds in the masts other than where the masts are welded to the steel bases. Each mast must be straight and centered on its longitudinal axis. Each mast must be formed on a mandrel and worked to form a round cross-section. The completed, unpainted masts shall have smooth external surfaces free from protuberances, dents, cracks or other imperfections marring their appearance.
- (d) Base. The mast base shall be a steel plate, of low alloy, high strength steel as noted in Par. 4 (b).

Plate Base. The base plate for each pole type shall be as listed in Table "A". It must be fabricated from the same ASTM A606 low alloy, high strength steel as is used for the mast. After fabrication the steel must meet the requirements of ASTM A588. The mast must be inserted into the base to a maximum depth which will still allow for an adequate weld to be made between the bottom of the mast and the plate. A circumferential weld must be made between the mast and the base at both the top and underside of the plate. Non-metallic removable bolt covers which completely cover the anchor bolts and nuts shall be provided. The covers must be attached with stainless steel screws coated with a non-seizing compound, or another type of non-seizing fastener, as approved by the Commissioner. The covers shall enclose the anchor bolts and be secured in an approved manner. The base shall be attached to the mast so that the bearing surface of the base is at right angles to the longitudinal axis of the mast. The vertical center line of the seam must be positioned so that no welds for the simplex attachments or the handhole opening will go through the seam.

Anchor Rod Openings. All anchor rod openings for each pole type shall have a width as listed in Table "A". Each opening must be sized to have a circumferential slot length equal to 15 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 shall neatly fit the external surface of the mast. The upper mast arm support plate must have a hollow protuberance, the hole of which must be approximately equivalent to two (2) inches in diameter, extending into the interior of the pole providing a smooth surface for the lamp cables to rest upon. The mast arm support plates shall be designed so that they will carry the mast arm and hold it in the proper position for fastening the mast arm to the mast. The design of the mast arm support plates must be a two (2) bolt type as shown on Drawing No. 659.

- (f) Provision for Ground. A 1/2-13 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 shall be treated with a compound to prevent seizing. Other non-seizing types of screws and fasteners may be considered. An alternate method of attachment consisting of a removable hinge on the bottom with a screw connection at the top may be considered. (The above requirements apply to all pole masts except those with a 10 inch bolt circle. Poles with 10 inch bolt circles must have handhole openings of 3" by 5". All other requirements apply.)
  
- (h) Door. The removable door must be formed of sheet steel approximately one-eighth (1/8) inch thick. It shall be flat or dished depending upon the pole type, and fit the doorframe closely so that it will stay in proper position even if its locking screws are slightly loosened. The door must be drilled top and bottom to accept the 1/4-20 hex head machine screws which will fasten the door to the doorframe. A half-circle piece of steel must be welded by the screw opening, to allow only a socket wrench to be used. All doors shall be interchangeable. An alternate method of attachment using an internal hinge at the bottom of the door with a screw at the top of the door will be considered. Any alternate method will be subject to approval by the Commissioner or his duly authorized representative.
  
- (i) Locking Device. Any other door locking device, other than the one outlined above in (g) and (h), must be approved by the Commissioner or his duly authorized representative.

- (j) Tag. To each pole must be attached immediately below the handhole, by mechanical means and not by adhesive, a stainless steel tag with a stamped or embossed legend which must include the pole outside diameter at the base, the overall length, and the gauge; i.e., 12.5" X 34'-6" X 3 gauge.
- (k) Structural Requirements. The mast shall be manufactured in accordance with AASTHO's 1994 version of the "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals". The shaft and base assembly must be designed to meet AASTHO's 1994 criteria for 80 MPH wind loading with a 30% gust factor. The poles shall be designed appropriately for Chicago applications for both street lighting and traffic signal applications, including signal mast arms.

### **TOP**

- 5. (a) Design. The mast top shall be essentially conical with a globe-shaped upper-end and having a minimum wall thickness throughout of not less than 1/4 inch. The cone portion must meet the skirted portion of the top in a smooth filet, the skirt must enclose the top 7/8" inches of the mast. Three stainless steel, or other similar approved material, set screws not less than 3/4 inches long must be equally spaced in tapped holes around the skirt and must hold the top securely in place atop the mast. The design of the top shall be similar to one shown on Drawing #11420A.
- (b) Material. The top must be aluminum alloy 356-F per ASTM B108. It shall have smooth surfaces, neat edges and corners and be free from fins, holes or other casting flaws. Non-metallic tops may be substituted if approved by the Commissioner.
- (c) Finish. Tops shall be painted as herein specified.

### **HARDWARE**

- 6. All the hardware necessary to complete the assembly of the pole shall be furnished. All hardware will be as specified elsewhere in these specifications. Hardware not specified elsewhere must be stainless steel meeting the requirements of ASTM A193, or equal corrosion-resistant non-seizing metal, or a non-metallic material subject to approval by the Commissioner.

## **WELDING**

7. (a) General. Every welded joint shall be made in conformity with the proper interpretation of the standard welding symbols of the American Welding Society as indicated on the drawings; however, each bidder must submit with his proposal a drawing showing the sizes and types of welds, must state the type of electrode, and must describe the welding methods, he proposes to use in fabricating the pole.
- (b) Testing. Welds shall be inspected for penetration and soundness of the welds by the magnetic particle inspection method or by radiography. Acceptance or rejection will be governed by the same conditions as in Section 9. If the magnetic inspection process is to be used, the dry method with the direct current must be employed. All transverse welds must be magnetized by the "prod" (Circular magnetization) method. Longitudinal welds may be magnetized by either circular or longitudinal magnetization.

## **PAINTING**

8. (a) Oil and Grease Removal. All metal surfaces shall be washed with an alkaline detergent to remove any oils or grease.
- (b) Metal Cleaning. All exterior metal surfaces shall be cleaned by blasting with a combination of shot and grit to remove all dirt, mill scale, rust, corrosion, oxides and foreign matter and provide a "near white" surface in accordance with SSPCS-SP10. Included in this process will be the interior base section of the mast to a minimum height of twelve (12) inches.
- (c) Chemical Pretreatment. The cleaned metal surfaces shall then be treated with a hot, pressurized iron phosphate wash and shall be dried by convection heat.
- (d) Primer Coat. All exterior surfaces are to be coated with 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 shall 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 shall be airless-spray applied and cured in a gas-fired convection oven by heating the steel substrate to between 150° Fahrenheit and 220° Fahrenheit.



- (f) Interior Coat. Interior surfaces are to be coated with red oxide rust inhibitive alkyd primer to a dry film thickness of 1.5 mils.
  - (g) Durability. Both the exterior and interior coats must be capable of passing 1,000 hours of salt spray exposure as per ASTM B117 in a 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.
- (i) Alternate Methods. Alternate painting methods may be reviewed and tested on a case by case basis. However, no coating method will be accepted unless the Commissioner judges such alternate to be equal to the coating herein specified.

## **MAST TEST**

9. (a) General. All completed masts shall be available for testing for maximum deflection and set. The masts shall meet the structural requirements of Section 4(k). Unless specifically authorized in writing, all tests shall be made at the works of the manufacturer. A record of every test must be made and a certified copy of the test record must be submitted to the Commissioner before the masts are shipped.
- (b) Lot. Tests for welds, deflection and set of the mast and of the mast arm supports shall be made upon three (3) masts of the first fifty (50) in every order. An additional one (1) mast shall be tested for each additional fifty (50) masts in the order. The selection of masts for testing shall be random from the entire completed lot. If any of the masts in any lot fail to meet the test, an additional three (3) masts of the same lot must be tested. If any of these masts fail to meet the test requirements, the entire lot will be subject to rejection, except that the manufacturer may subject each mast in the lot to the test, and those which fulfill the requirement will be accepted. After testing, each base weld must be inspected by the magnetic particle method to determine that the welds have not been affected.

- (c) Mast Requirements. With base rigidly anchored, a test load as indicated in Table A must be applied at a point approximately two feet (2'0") from the free end. The load must be applied at right angles to the center line of the mast and in the same vertical plane. The deflection must not be greater than that indicated in Table A. Within one (1) minute after the test load is released, measurement must be made of the set taken by the mast. This set must not be greater than that indicated in Table A. The deflection measurement device must be reset to zero and the test load must be reapplied. The deflection must not change from the deflection noted in the first test by more than  $\pm 5\%$ . 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.

## **PACKAGING**

- 10. (a) General. The poles must be shipped in twelve (12) pole bundles. Each pole must be individually wrapped so that the pole can be bundled for shipping and unbundled for delivery to the City without damaging the pole or its finish.
- (b) Bundles. The bundles shall consist of twelve (12) poles laid base to top to form an approximately rectangular cylinder. Materials such as lumber (2" x 4" min.), non-marring banding, and other appropriate bundling materials must be used to make a rigid, long lasting, bundle capable of being handled, shipped and stored without shifting of contents or breaking, subject to approval. Any bundles, in which either poles or packaging is received broken, damaged or with contents shifted, will not be accepted and it will be the responsibility of the supplier to return the bundle to its original destination at no cost to the City of Chicago. The bundles should be capable of being stacked two (2) high without breaking, or shifting of the contents. Each bundle must be capable of being lifted by a fork lift truck or crane and the bundles must be shipped on a flatbed 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 Division of Electrical Operation's storage yard at 4101 South Cicero Avenue in Chicago, or to another location within the City as indicated on the order. Light pole information shall include any recommendations of the manufacturer for storage.

**TABLE A**

POLE	GAUGE	BOLT CIRCLE	ANCHOR ROD	BASE PLATE	TEST LOAD	MAX. DEF	MAX. SET	DRAWING
7.67"x12.5" x34'6"	3	16.5"	1.5"	1.75"	3200#	22"	2.5"	827
6.17"x11"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

**ELECTRICAL SPECIFICATION 1450  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
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 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. They are integral parts of this specification cooperating to state necessary requirements.
- (d) Bidders Drawings. Bidders shall 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 shall 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 shall 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 shall 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 shall 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 shall be smooth and even without protrusions, nicks, holes or other imperfections.

#### **PAINING**

- 4. (a) Oil and Grease Removal. All metal surfaces shall be washed with an alkaline detergent to remove any oils or grease.
- (b) Metal Cleaning. All exterior metal surfaces shall be cleaned by blasting with a combination of shot and grit to remove all dirt, mill scale, rust, corrosion, oxides and foreign matter and provide a "near white" surface in accordance with SSPCS-SP10. Included in this process shall be one to two inches of the interior section of the mast arm.
- (c) Chemical Pretreatment. The cleaned metal surfaces shall be treated with a hot, pressurized iron phosphate wash and shall 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 shall 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 shall be made in conformity with the proper interpretation of the standard welding symbols of the American Welding Society as indicated on the drawings; however, each bidder must submit with his proposal a drawing showing the sizes and types of welds, must state the type of electrode, and must describe the welding methods he proposes to employ in fabricating the mast arm.
- (b) Testing. The welds shall 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) All test results must be certified by the manufacturer. Documentation must be available for the City to approve.

**PACKAGING**

8. (a) General. The arms shall 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 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.

**ELECTRICAL SPECIFICATION 1454  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
REVISED APRIL 20, 2007**

**MAST ARM: TRAFFIC SIGNAL MONO-TUBE**

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**SUBJECT**

1. This specification states the requirements for a tapered, tubular, 7 gauge steel mono-tube arm with mounting brackets. The arm will support traffic signals and signs.

**GENERAL**

2. (a) Specifications. The arms shall conform in detail to the requirements herein stated, and to the Specifications and Methods of Test of the American Society for Testing and Materials cited by ASTM Designation Number of which the most recently published revisions will govern.
- (b) Acceptance. Arms not conforming to this specification will not be accepted.
- (c) Bidders Drawings. Bidders must submit with their bids detailed scale drawings of the mast arm showing actual dimensions, details, and welds. Shop drawings must be original engineering drawings created by the manufacturer. The drawings must show every dimension necessary to show how all parts will fit each other and be properly held in assembly. These drawings shall also be submitted in electronic format, preferably Microstation 95, if so requested by the City.
- (d) Drawings. The drawings mentioned herein are drawings of the Department of Transportation being an integral part of this specification cooperating to state necessary requirements.
- (e) Sample. If requested by the Chief Procurement Officer, one complete mast arm of the manufacture intended to be furnished must be submitted for review by the Commissioner within fifteen (15) business days of receiving such request.

- (f) Warranty. The manufacturer shall warrant the performance and construction of the mast arms to meet the requirements of this specification and shall warrant all parts, components, and appurtenances against defects due to design , workmanship, or material developing within a period of five years after the mast arms have been delivered. This will be interpreted particularly to mean structural or mechanical failure of any element or weld, or failure of any portion of the painting system. The warranty must be furnished in writing guaranteeing material replacement including shipment, free of charge to the City. The Commissioner will be the sole judge in determining which replacements are to be made and the Commissioner's decision will be final.

### **STANDARDS**

3. (a) Assembly. Each arm shall consist of a tubular tapered steel shaft, mounting brackets, an aluminum cap, and all mounting hardware.
- (b) Interchangeability. Members of each arm type must be mutually interchangeable for assembly, so that no reworking will be required to make any member fit properly in the place of any other similar member of any other similar arm.
- (c) Design. Each arm must meet the requirements as shown on Standard Drawing 870.

### **ARMS**

4. (a) Arm Size. The outside diameters of the arm of each size shall be as listed in Standard Drawing 870.
- (b) Material. The arm must be fabricated from one length of No. 7 Standard gauge steel meeting the requirements of ASTM A606 for low alloy high strength coil steel, which, after fabrication, must possess an ultimate tensile strength of not less than 70,000 psi and a yield strength of not less than 60,000 psi, in accordance with ASTM A595, Grade C. Chemistry of the steel shall be such as to insure resistance to atmospheric corrosion superior to that of ordinary copper bearing steel. Material certification is required. Manufacturer's steel meeting the specified physical and chemical requirements, and approved by the Commissioner, will be accepted.

- (c) Fabrication. The arm must be fabricated with not more than one (1) longitudinal weld. The weld must be ground smooth so that it is virtually invisible. There must be no lateral welds in the arms other than where the arms are welded to the steel clamp. Each arm must be straight and centered on its longitudinal axis. Each arm must be formed on a mandrel and worked to form a round cross-section. The completed, unpainted arms shall have smooth external surfaces free from protuberances, dents, cracks or other imperfections marring their appearance.
- (d) Clamp. The arm clamp must be of low alloy, high strength steel as noted in Section 4 (b). The clamp must be constructed as shown on Standard Drawing 870.
- (e) Structural Requirements. The mast arm must be manufactured in accordance with AASTHO's 1994 version of the Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals. The arm assembly must be designed to meet AASTHO's 1994 criteria for 80 MPH wind loading with a 30% gust factor. The arms shall be designed appropriately for traffic signal applications within the City of Chicago.

#### **CAP**

- 5. (a) Design. The arm cap shall be essentially conical with a globe-shaped upper-end and having a minimum wall thickness throughout of not less than 5/32 inches. The cone portion must meet the skirted portion of the arm in a smooth fillet, the skirt must enclose the top 7/8" inches of the arm. Three stainless steel, or other similar approved material, set screws not less than 3/4 inches long must be equally spaced in tapped holes around the skirt and must hold the cap securely in place on the arm.
- (b) Material. The cap must be of aluminum alloy 356-F per ASTM B108. It shall have smooth surfaces, neat edges and corners and be free from fins, holes or other casting flaws.
- (c) Finish. Tops shall be painted as herein specified.

#### **HARDWARE**

- 6. All the hardware necessary to complete the assembly of the arm must be furnished. All hardware shall be stainless steel, or equal corrosion-resistant non-seizing metal, subject to approval.

## **WELDING**

7. (a) General. Every welded joint shall be made in conformity with the proper interpretation of the standard welding symbols of the American Welding Society as indicated on the drawings; however, each bidder must submit with his proposal a drawing showing the sizes and types of welds, must state the type of electrode, and must describe the welding methods, he proposes to use in fabricating the arm.
- (b) Testing. All welds of the first three (3) arms of the first fifty (50) arms in every lot must be inspected for penetration and soundness of the welds by the magnetic particle inspection method or by radiography. Acceptance or rejection must be governed by the same conditions as in Section 9. If the magnetic inspection process is used, the dry method with the direct current shall be employed. All transverse welds must be magnetized by the "prod" (circular magnetization) method. Longitudinal welds may be magnetized by either circular or longitudinal magnetization.

## **PAINTING**

8. (a) Oil and Grease Removal. All metal surfaces must be washed with an alkaline detergent to remove any oils or grease.
- (b) Metal Cleaning. All exterior metal surfaces must be cleaned by blasting with a combination of shot and grit to remove all dirt, mill scale, rust, corrosion, oxides and foreign matter and provide a "near white" surface in accordance with SSPC-SP 10.
- (c) Chemical Pretreatment. The cleaned metal surfaces must then be treated with a hot, pressurized iron phosphate wash and must be dried by convection heat.
- (d) Primer Coat. All exterior surfaces are to be coated with Tnemec 90-97 corrosion-inhibiting zinc-rich aromatic urethane to a minimum dry film thickness of 2.5 mils (.0025"). The aromatic urethane is to consist of a zinc dust content not less than 83% by weight in dried film. The coating must be airless-spray applied and moisture cured.
- (e) Finish Coat. All exterior surfaces are to be subsequently coated with Tnemec Endura-Shield II 1074 aliphatic acrylic polyurethane to a minimum dry film thickness of 3.0 mils (.003"). The coating must be airless-spray applied and cured in an oven by heating the steel substrate to between 150° Fahrenheit and 220° Fahrenheit.

- (f) Interior Coat. Interior surfaces are to be coated with red oxide rust inhibitive alkyd primer to a dry film thickness of 1.5 mils.
- (g) Durability. Both the exterior and interior coats must be capable of passing 1,000 hours of salt spray exposure as per ASTM B117 in a five percent (5%) Na Cl (by weight) solution at 95°F and 95% relative humidity without blistering. Before test, the panel must be scribed with an "X" down to bare metal.
- (h) Coating Measurement. Measurement of coating thickness must be done in accordance with SSPC-Pa 2-73T, "Measurement of Dry Paint Thickness with Magnetic Gauges," except that the lowest "single spot measurement" in an area of two square inches must not be less than 5.5 mils.
- (i) Color. Color must be gloss black unless noted otherwise in the order. A paint chip must be submitted for approval prior to fabrication.
- (j) Alternate Methods. Alternate coating methods may be reviewed and tested on a case by case basis. However, no coating method will be accepted unless the Commissioner judges such alternate to be equal to the coating herein specified.

#### **ARM TEST**

- 9. (a) General. All completed arms shall be available for testing for maximum deflection and set. Unless specifically authorized in writing, all tests must be made at the works of the manufacturer. A record of every test must be made and a certified copy of the test record must be submitted to the Engineer of Electricity before the arms are shipped.
- (b) Lot. Tests for deflection and set must be made upon the first three (3) arms in the first fifty (50) arms in the lot. An additional one (1) arm must be tested for each additional fifty (50) arms. If any of the arms in any lot fail to meet the test, an additional three (3) arms of the same lot must be tested. If any of these arms fail to meet the test requirements, the entire lot will be subject to rejection, except that the manufacturer may subject each arm in the lot to the test, and those which fulfill the requirement will be accepted. After testing, each weld must be inspected by the magnetic particle method to determine that the welds have not been affected.

- (c) Requirements. With arm rigidly anchored, a test load as indicated in the table in Standard Drawing 870 must be applied at a point approximately two feet (2'0") from the free end. The load must be applied at right angles to the center line of the arm and in the same vertical plane. The deflection must not be greater than that indicated. Within one (1) minute after the test load is released, measurement must be made of the set taken by the arm. The deflection measurement device must be reset to zero and the test load must be reapplied. The deflection must not change from the deflection noted in the first test by more than  $\pm 5\%$ . No measurable set must be noted within one (1) minute after test load is released.

## **PACKAGING**

10. (a) General. The arms shall be shipped in twelve (12) arm bundles. Each arm must be individually wrapped so that the arm can be bundled for shipping and unbundled for delivery to the job site without damaging the arm or its finish.
- (b) Bundles. The bundles shall consist of twelve (12) arms laid base to top to form an approximately rectangular cylinder. Materials such as lumber (2" x 4" min.), non-marring banding, and other appropriate bundling materials must be used to make a rigid, long lasting, bundle capable of being handled, shipped and stored without shifting of contents or breaking, subject to approval. Any bundles, in which either arms or packaging is received broken, damaged or with contents shifted, will not be accepted and it will be the responsibility of the supplier to return the bundle to its original destination at no cost to the City of Chicago. The bundles should be capable of being stacked two (2) high without breaking, or shifting of the contents. Each bundle must be capable of being lifted by a fork lift truck or crane and the bundles must be shipped on a flatbed truck to facilitate unloading. Each arm wrapping must be clearly labeled indicating the mast size, i.e. 30' SIGNAL MAST ARM.
- (c) Hardware. The hardware must be shipped with each bundle and packaged in twelve (12) sets of four (4) each. The package shall be placed in a prominent position to facilitate accessibility, and must be attached to, or within, the bundle in such a manner as to assure safe delivery. Payment will be withheld for any bundle delivered without the accompanying hardware. Arm caps must be attached at the manufacturer's facilities, or be packed separately in a manner similar to the other hardware, and the same payment conditions will prevail. Cracked, broken or chipped parts will be considered as an incomplete delivery as regards payment.



- (d) Delivery. All mast arms will be delivered to the Division of Electrical Operations storage yard at 4101 South Cicero Avenue in Chicago, or to another location within the City as indicated on the order.

**ELECTRICAL SPECIFICATION 1457  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
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 shall conform in detail to the requirements herein stated, and to the applicable portions of the specifications and methods of test of the following agencies:
  - (1) ICEA Specification S-95-658
  - (2) IEEE Standard 383
  - (3) ASTM Standard E-662-79
  - (4) ASTM Standard D-470-81
  - (5) 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 shall warranty the cable to be first class material throughout. If the cable is installed within one year of the date of shipment, the manufacturer must replace any cable failing during normal and proper use within two years of installation. The cable length to be replaced will be the entire unspliced length where the fault has been located. The Commissioner will be the sole judge in determining if a cable has failed and should be replaced. All replacements under this warranty must be made free of charge F.O.B. delivery point of the original contract

### **CABLE**

3. (a) Construction. The cable must consist of three (3) conductors separately insulated and color coded. Suitable fillers must be used to produce essentially a round cross section in the completed cable. The insulated conductors must be cabled with a suitable left hand lay in conformance with the latest revision of ICEA S-95-658. A binder tape must be used over the cabled conductor assembly and a jacket applied overall.
- (b) Sealing. The ends of each length of cable shall be sealed against the entrance of moisture.
- (c) Marking. The color of the neutral conductor must be white; that of the phase conductors must be black and red, respectively. The jacket must be black.
- (d) Each conductor shall consist of a round copper wire with a tight fitting, free stripping, concentric layer of Ethylene Propylene insulation. The cable must be rated for continuous duty at 90°C operating temperature, wet or dry, 130°C emergency overload temperature and 250°C short circuit temperature.

### **CONDUCTOR**

4. (a) Material. The conductor shall either be soft or annealed round copper wire, tin coated.
- (b) Specifications. The conductor must meet the requirements of ASTM B3, and B8 for stranded Class B copper.
- (c) Size. The conductor size shall be as stated in the proposal or on the plans.

**INSULATION**

5. (a) Type. The insulation must be Ethylene Propylene compound meeting the physical and electrical requirements specified herein.
- (b) Thickness. The insulation must be circular in cross-section, concentric to the conductor, and must have an average thickness not less than 30 mils (.030") for #14 AWG, 55 mils (.055") for #4 AWG, 65 mils (.065") for #2 AWG, 80 mils (.080") for #1/0 AWG, 80 mils (.080") for #2/0 AWG ,and a spot thickness not less than ninety percent (90%) of the average thickness.
- (c) Initial Physical Requirements:
- |                                   |      |
|-----------------------------------|------|
| (1) Tensile Strength, min., psi.  | 1200 |
| (2) Elongation at Rupture, min. % | 250  |
- (d) Air Oven Exposure Test. After conditioning in an air oven at  $121 \pm 1^{\circ}\text{C}$  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<br>(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 shall be either a chlorosulfonated polyethylene (CSPE) or a polyvinylchloride (PVC) compound meeting the physical and electrical requirements specified herein. CSPE must meet the environmental requirements of CFR Title 40, Part 261 for leachable lead content.
- (b) Thickness. The jacket must be circular in cross-section, concentric with the insulation, must have an average thickness not less than 45 mils (.045") for #14 AWG, 80 mils (.080") for #2 and #4 AWG, and not less than 95 mils (.095") for #1/0 and #2/0 AWG, and a spot thickness not less than ninety percent (90%) of the average thickness.
- (c) Initial Physical Requirements:
- (1) Tensile strength minimum PSI..... 1800
  - (2) Elongation at rupture, minimum percent 300
- (d) Air Oven Exposure Test. After conditioning in an air oven at  $121 \pm 1^{\circ}\text{C}$  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 shall be performed on insulation, jacket and completed cables in accordance with the applicable standards as listed in these specifications. Included in these tests will be a 70,000 BTU per hour flame test in accordance with IEEE 383. Where standards are at variance with each other or with other portions of this specification, the most stringent requirements, as determined by an engineer from the Division of Engineering, will apply. All tests shall be conducted on cable produced for this order.

- (b) Number of Tests. Insulation and jacket tests shall be conducted on samples taken every 5,000 feet or fraction thereof of each conductor size. In no case must less than two (2) samples be taken. Approximately five percent (5%) of the cable must be tested. Where the cable fails to conform to any of the tests specified herein, samples must be taken from each reel and must successfully conform to all tests specified herein. Reels from which samples fail to conform, will be rejected.
- (c) Test Reports. No cable may be shipped until certified copies of all factory tests have been reviewed and approved by the engineer.

**PACKAGING**

- 8. (a) Cable Marking. The cable must be identified by a permanently inscribed legend in white lettering as follows:  
  
3/C - No. (conductor size)AWG-600V-90°C-EPR/CSPE or EPR/PVC-  
manufacturer's name- month/year of manufacture  
  
The legend must be repeated at approximately eighteen (18) inch intervals on the outside surface of the cable parallel to the longitudinal axis of the conductor.
- (b) Reels. The completed cable shall be delivered on sound substantial, non-returnable reels. Both ends of each length of cable must be properly sealed against the entrance of moisture and other foreign matter by the use of clamp-on cable caps. The ends must be securely fastened so as not to become loose in transit. Before shipment, all reels must be wrapped with cardboard or other approved wrapping.
- (c) Footage. Each reel must contain 1,000 foot of cable for either #4 AWG or #2 AWG and 500 feet of cable for #1/0 AWG or #2/0 AWG. A tolerance limit of plus or minus ten percent ( $\pm 10\%$ ) shall be adhered to.
- (d) Reel Marking. A metal tag must be securely attached to each reel indicating the reel number, contract number, date of shipment, gross and tare weights, description of the cable and the total footage. Directions for unrolling the cable must be placed on the reel with an approved permanent marking material such as oil-based paint or a securely attached metal tag.

TABLE 1 - THREE CONDUCTOR SERVICE ENTRANCE CABLE

Size (AWG)	Overall Diameter (mils)	No. Of Strands	Test Volts (KV)	Footage per Reel	Insulation (mils)	Jacket (mils)
4	950	7	4.5	1000	55	80
2	1100	7	4.5	1000	65	80
1/0	1400	19	5.5	500	80	95
2/0	1800	19	5.5	500	80	95

**ELECTRICAL SPECIFICATION 1458  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
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 shall conform with every detail of the requirements herein stated and to the specifications and methods of test of the American Society for Testing and Materials cited by ASTM Designation Number in which the most recently published revision will govern.
- (b) Acceptance. Frames and covers not conforming to this specification will not be accepted. The Commissioner of Transportation will have the final say as to whether or not the frames and covers meet specifications.
- (c) Drawings. The drawings mentioned herein are drawings of the Department of Transportation, Division of Engineering, and must be interpreted as part of these specifications.
- (d) Sample. Upon request, one complete manhole frame and cover of the manufacture intended to be furnished must be submitted within fifteen (15) business days after receipt of such a request from the Chief Procurement Officer. The samples must be delivered to the Division of Electrical Operations, 4101 South Cicero Avenue, Chicago, Illinois.



- (e) Warranty. The manufacturer shall warrant that the frames and covers meet the specifications and warrant the frames and covers for a period of one (1) year from the date of delivery against defects which may occur during that period from normal and customary use. Any frame or cover which fails during this period must be replaced by the manufacturer at no cost to the City.

### **DESIGN**

- 3. (a) The frames and covers shall each conform in detail to the designs shown on Drawings 872, 874 and 10927.
- (b) Each frame and cover shall weigh approximately as shown on the drawings.
- (c) Machining. The bearing surfaces of both the cover and the frame shall be machine finished as indicated on the drawings.
- (d) Workmanship. The frames and covers must be mutually interchangeable size for size, so that each lid will fit every frame neatly without jamming and with only such clearance as the drawings indicate. In addition, 24" & 30" covers must fit existing 24" & 30" frames, as shown on drawings 872, 874 and 10927. The castings shall be neat, true to pattern and free from cracks and casting flaws. No welding of defective castings will be permitted nor must the castings be painted.
- (e) Material. The frames and covers must be made of Class 30 Cast Iron described in the specifications for Gray Iron Castings of ASTM A48. No plugging of defective castings will be permitted.

### **TESTS**

- 4. (a) Test bars of the metal used for the castings shall be made and tested for tensile and transverse strength in accordance with ASTM A48. The metal must be tested at the works of the manufacturer. The manufacturer must furnish a certified copy of all test data sheets to the City prior to delivery of the castings. Frames and covers shall each be considered a separate casting for determining the requirement of testing.

**ELECTRICAL SPECIFICATION 1462  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
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 shall be manufactured according to Underwriters Laboratories Standard U.L. - 6 and must meet ANSI Standard C 80.1 and the requirements of NEC Article 344. In addition, conduit must be recognized as an equipment grounding conductor as per NEC Article 250.118(2). There will be no exceptions to meeting these standards.
- (c) Acceptance. Conduit not conforming to this specification will be rejected. The Commissioner will be the final judge in determining if the conduit meets the specification.
- (d) Sample. If requested by the Chief Procurement Officer, a sample of conduit must be submitted to the Engineer of Electricity within fifteen (15) business days of receipt of such a request.
- (e) Warranty. The manufacturer shall warrant the construction and performance of the conduit to meet the requirements of this specification and shall warrant all parts and components against defects due to design, workmanship, or material developing within a period of one (1) year after the conduit has been delivered.

## **STEEL**

3. Conduit shall be formed from steel suitable for use as an electrical raceway. It shall be structurally sound so that it will hang straight and true when supported by hangers in accordance with Chicago electrical code requirements and shall be capable of being field bent without deformation of the walls.

Conduit shall have a circular cross section sufficiently accurate to permit the cutting of threads in accordance with Table 2 and shall provide a uniform wall thickness throughout. All surfaces shall be smooth and free of injurious defects. The dimensions and weights of rigid steel conduit must be in accordance with Table 1.

## **THREADING AND CHAMFERING**

4. Each length of conduit, and each nipple, elbow and bend must be threaded on both ends, and each end must be chamfered to remove burrs and sharp edges.

The number of threads per inch, and the length of the threaded portion at each end of each length of conduit, nipple and elbow must be as indicated in Table 2. The perfect thread must be tapered for its entire length, and the taper must be 3/4 inch per foot.

## **ZINC COATING**

5. After all cutting, threading, and chamfering all conduit surfaces shall be thoroughly cleaned before application of zinc. The cleaning process shall leave the interior and exterior surfaces of the conduit in such a condition that the zinc will be firmly adherent and smooth.

The conduit must be hot dipped galvanized both inside and out to provide approximately two (2) ounces of zinc per square foot. This is equivalent to 3.4 mils of zinc coating. An additional interior coating to aid in the installation of wires is required.

### **COUPLINGS**

6. (a) The outside surface of couplings shall be protected by means of a zinc coating. The zinc content of the coating on the outside surface must be equivalent to a minimum thickness of 3.4 mils.
- (b) Couplings shall be so made that all threads will be covered when the coupling is pulled tight on standard conduit threads.
- (c) Both ends of the coupling must be chamfered to prevent damage to the starting threads.
- (d) The outside diameter, length and weight of coupling must be as indicated in Table 3.
- (e) Couplings must be straight tapped, except that the 2 1/2 inch and larger sizes may be taper-tapped.

### **PVC COATED (WHEN SPECIFIED)**

7. (a) Only hot dipped galvanized conduit, couplings, and fittings may be polyvinylchloride (PVC) coated.
- (b) All conduit, couplings, and fittings must be cleaned before being coated.
- (c) All conduit, couplings, and fittings must have a PVC coating applied to the exterior by dipping in liquid plastisol. The coating thickness must be a nominal 40 mils.
- (d) All coated conduit, couplings, and fittings must conform to the requirements of NEMA Standard RN1- Section 3 , "External Coatings". The latest revision will apply.

### **PACKING AND IDENTIFICATION**

8. The pipe shall be delivered in bundles. Each length of conduit must be marked with the manufacturer's name or trademark. Securely attached to each bundle at two (2) locations on the bundle must be a weather resistant tag containing the following information:
  - a. conduit size
  - b. footage of bundle
  - c. gross weight of bundle

Precaution will be taken by the contractor in handling during shipment or delivery of conduit, and any conduit found to be damaged will not be accepted.

### **TEST AND INSPECTION**

9. Galvanized rigid conduit must be capable of being bent cold into a quarter of a circle around a mandrel, the radius of which is four times the nominal size of the conduit, without developing cracks at any portion and without opening the weld.

The protective coatings used on the outside and inside surfaces of rigid steel conduit must be sufficiently elastic to prevent their cracking or flaking off when a finished sample of 2 inch conduit is tested within one year after the time of manufacture, by bending it into a half of a circle around a mandrel, the radius of which is 3 1/2 inches.

Tests on sizes other than 1/2 inch may be conducted within one year after the time of manufacture. If such tests are conducted, the conduit must be bent into a quarter of a circle around a mandrel, the radius of which is six times the nominal size of the conduit.

One of the following three test methods shall be employed for measuring the thickness or extent of the external zinc coating on conduit:

- (a) Magnetic test.
- (b) Dropping test.
- (c) Preece test (Material which will withstand four 1-minute immersions will be considered as meeting requirements as follows; the zinc content of the coating on the outside surface must be equivalent to a minimum thickness of 3.4 mils).

All tests and inspections must be made at the place of manufacture prior to shipment unless otherwise specified, and shall be so conducted as not to interfere with normal manufacturing processes.

Each length of conduit shall be examined visually both on the outside and inside to determine if the product is free from slivers, burrs, scale or other similar injurious defects (or a combination thereof), and if coverage of the coating is complete.

If any samples of rigid steel conduit tested as prescribed in this specification should fail, two additional samples must be tested, both of which must comply with the requirements of the specification.

All pipe which may develop any defect under tests, or which may before testing or on delivery be found defective, or not in accordance with these specifications, must be removed by the Contractor at his own expense; and such pipe so removed by the Contractor must be replaced by him within ten (10) days of such rejection with other pipe which will conform to these specifications.

**TABLE 1**

**Design Dimension and Weights of Rigid Steel Conduit**

Nominal or Trade Size of Conduit	Inside Diameter	Outside Diameter	Wall Thickness	Length Without Coupling	Minimum Weight of Ten Unit Length w/couplings
(Inches) (Pounds)	(Inches)	(Inches)	(Inches)	(Feet/Inches)	
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

**ELECTRICAL SPECIFICATION 1463  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
REVISED JUNE 22, 2001**

**TRAFFIC SIGNAL MOUNTING BRACKETS FOR MONOTUBE ARMS**

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**SUBJECT**

1. This specification states the requirements for mounting brackets which will be used to secure traffic signals and illuminated signs to steel monotube mast arms.

**GENERAL**

2. (a) Specifications. The mounting brackets shall conform in detail to the requirements herein stated and to the specifications and methods of test of the American Society for Testing and Materials cited by ASTM Designation number of which the most recently published revision will govern.
- (b) Acceptance. Mounting brackets not conforming to these specifications will not be accepted.
- (c) Sample. If requested by the Chief Procurement Officer, one complete mounting bracket must be submitted within fifteen (15) business days upon receipt of such a request. It must be delivered to the Division of Electrical Operations, 2451 South Ashland Avenue, Chicago, Illinois 60608.
- (d) Experience. The manufacturer shall demonstrate a knowledge of past production of the brackets herein described, as demonstrated by a submittal list of comparable projects.

- (e) Warranty. Bracket must have a minimum three (3) year warranty. The warranty must cover the material and workmanship. Any structural flaws or inability to maintain alignment will be deemed a failure and result in the warranty being invoked. The manufacturer will supply a new bracket for each failed bracket, at no cost to the City.

### **DESIGN**

- 3. (a) General. The mounting bracket shall be designed such that no portion of the bracket is put into tension when it is attached to the mast arm with banding. The signal support tube will be attached to the bracket using compression type attachments. All materials must be corrosion resistant and designed to be structurally sound. The signal support tube will be a slotted aluminum pipe of sufficient length to hold either a 3, 4, or 5 section signal head, or an illuminated sign. The slot must have a neoprene gasket to protect the cable. There must also be top and bottom brackets that hold the signal head assembly at each end to the tube. The bottom bracket will also be used as a cable runway.
- (b) Hardware. All components of the mounting brackets must be held firmly in place with stainless steel hardware.
- (c) Adjustments. Bracket shall allow for mounting and adjustment of signal faces in any direction desired on a fixed mast arm. Adjustments shall be made using standard hand tools. Neither mounting nor adjusting the bracket should require the use of a torque wrench.
- (d) Signal Mounting. Mounting hardware shall be available for use with standard two, three and five signal head configurations; for use with optically programmed signal heads; and with signs.
- (e) Wiring. Bracket design shall allow for ease of installation of components and wiring. All wiring troughs and nipples must provide smooth, burr-free surfaces and adequate space for facile movement of nominal 2" diameter cable between the mast arm and the signal face.
- (f) Banding. Where banding is used to attach the mounting bracket to the mast arm, the banding must be 3/4" x 42" stainless steel.
- (g) Castings. Where castings are used for the brackets, they shall be smooth and free of defects.

### **TESTING**

- 4. (a) General. One Percent (1%) of the traffic signal mounting brackets in each order shall be tested for rigidity and structural integrity.

- (b) Re-testing. If any mounting bracket fails any portion of the test, an additional three percent (3%) of the brackets must be tested. If an additional bracket fails, the entire lot will be rejected.
- (c) Tests.
1. With five (5), twelve inch (12") signal head sections attached to the bracket, the assembly shall be mounted to a suitable and proper supporting structure.
  2. Using a calibrated dynamometer, a one hundred pound force must be applied for sixty seconds at the center of the bracket in the horizontal plane. At the completion of the test, there must be no movement of the assembly or deterioration of the bracket or appurtenant hardware.
  3. Using a calibrated dynamometer, a one hundred pound force must be applied to the top signal head section for sixty seconds in a direction which will pull the head away from the mounting post in the mounting post plane. During this time period, the mounting bracket castings must be struck ten times with an eight ounce flat head hammer at the point(s) which appear to be most vulnerable to stress. At the completion of the test, no movement of the assembly must have been observed and there must be no cracking of the castings or deterioration of the appurtenant hardware.
  4. The above test must be repeated except that the force must be applied in a plane which is perpendicular to the mounting post plane.

**ELECTRICAL SPECIFICATION 1465  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
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 Division of Electrical Operations, 2451 S. Ashland Avenue, Chicago, Illinois 60608.
- (c) Warranty. The manufacturer shall warrant every ground rod against defects due to design, workmanship, or material developing within a period of one (1) year after the ground rod has been accepted. Any ground rod which fails during this period must be replaced by the contractor without expense to the City. The Commissioner of Transportation or his duly authorized representative will be the sole judge in determining which replacements are to be made.
- (d) The Commissioner will be the sole judge in determining whether the submitted ground rods meet the requirements of this specification. Ground rods not accepted must be removed at the sole expense of the contractor.

**DESIGN**

3. (a) The ground rods and couplings must meet the latest requirements of (National Electrical Manufacturer's Association) NEMA Standard GR-1, for copper bonded ground rod electrodes and couplings. The ground rods must also meet the requirements of (Underwriter's Laboratories) UL 467.
- (b) Ground rods shall be made of steel core suitable for driving into the earth without deformation.
- (c) A uniform covering of electrolytic copper, 10 mils in thickness, shall be metallically bonded to the steel core to provide a corrosion resistant, inseparable bond between the steel core and the copper overlay.
- (d) The finished rod must be of uniform cross-section; straight, and free of nicks, cuts or protuberances.
- (e) The rod must be pointed at one end and chamfered at the other.
- (f) All ground rods must be three-quarter inches (3/4") in diameter. The length shall be as specified in the order or in the plans. The length and diameter of the rod and the manufacturer must be clearly and permanently marked near the top of the rod (chamfered end).
- (g) All ground rods must have a ground clamp capable of accommodating a No. 6 AWG Copper Wire.

**PACKING**

4. (a) Ground rods must be packed in bundles with reinforced tape or plastic banding that will not damage the rods. Small bundles may then be bound in larger bundles held together with steel banding.
- (b) Ground clamps must be packed in a suitable carton. The carton must be labeled to indicate the contents.

**SPECIFICATION 1467**  
**DIVISION OF ELECTRICAL OPERATIONS**  
**DEPARTMENT OF TRANSPORTATION**  
**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 street light pole foundations.

**GENERAL**

2. (a) Specifications. The anchor rods shall conform in detail to the requirements herein stated, and to the specifications of the American Society for Testing and Materials cited by ASTM Designation Number, of which the most recently published revision will govern.
- (b) Drawing. The drawings mentioned herein are issued by the Department of Transportation, Division of Engineering, and are an integral part of this specification.

**ANCHOR ROD**

3. (a) Fabrication. Each anchor rod must be fabricated in conformity with City of Chicago drawings numbered 806, 811, 830 and 844.
- (b) Material. The rods must be fabricated from cold rolled carbon steel bar meeting the requirements of ASTM Specification A-36, except that the Specification must be modified to provide a minimum yield point of 55,000 psi (379 MPa).
- (c) Thread. The straight end of each rod must be threaded as shown on City of Chicago drawing for that size rod, and must be American Standard, National Coarse.

**HARDWARE**

4. Hardware furnished with the anchor rod shall be as shown on the applicable drawing. It must include two (2) hexagonal nuts, American Standard Regular, two (2) flat washers, type B, series W, and one (1) lock washer, steel, helical spring. The nuts must have a Class 2 or 3 fit.

**FINISH**

5. (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.



**ELECTRICAL SPECIFICATION 1475  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
REVISED SEPTEMBER 26, 2006**

**CORD: TRAFFIC SIGNAL, EIGHT CONDUCTOR NO. 16 AWG, 600 VOLT**

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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 shall be flame retardant, have low acid gas content, good resistance to oil, moisture and mechanical abuse, and exhibit excellent heat aging and electrical characteristics.

**GENERAL**

2. (a) Specifications. The cable shall conform in detail to the requirements herein stated, and to the specifications and methods of test of the American Society for Testing and Materials cited by ASTM Designation Number, the Underwriters Laboratories, Inc. Standard or Style number and any other recognized standardization group's specifications referred to by the appropriate designation, of which the most recently published revision will govern.
- (b) Acceptance. Cable not conforming to this specification will not be accepted.
- (c) Warranty. The manufacturer shall warrant the cable to be first class material throughout. In addition to any other claims against them, if the cable is installed within six months of date of shipment, the manufacturer must replace any cable failing during normal and proper use within two years of date of installation. All replacements under this warranty must be made free of charge F.O.B. delivery point of the original contract.
- (d) Sample. If requested by the Chief Procurement Officer, a three (3) foot sample of the cable intended to be provided under this specification must be submitted to the attention of the Engineer of Electricity within fifteen (15) business days after receipt of such request.

### **CABLE**

3. (a) Construction. This cable shall consist of stranded, coated, conductors each concentrically encased with a "free stripping," ethylene propylene rubber insulation. Suitable fillers shall be used to produce an essentially round cross-section. The insulated conductors and the fillers must be cabled with a suitable left-hand lay as close together as is consistent with forming a core of minimum diameter. A Mylar tape must be wrapped over the conductor assembly, and a jacket applied overall.
- (b) Outer Diameter. The maximum allowable outer diameter must be one-half (0.50) inch.
- (c) Sealing. Both ends of each length of cable must be thoroughly sealed to prevent the entrance of moisture or other foreign matter.

### **MARKING**

4. (a) Conductors. Identification must be provided by colors in accordance with I.M.S.A. Standards.
- (b) Jacket. The outer jacket must be marked as follows: "8/C 16 AWG 600V 90°C LSZH, name of manufacturer and date of manufacture. The height of letters must not be less than 1/8 inch in height and the message must repeat at approximately two (2) foot intervals. A sequential footage marking must be located on the opposite side of the jacket. All marking must be perfectly legible with permanent white ink.

### **CONDUCTOR**

5. (a) Material. Round, Soft or annealed, stranded copper wire in accordance with ASTM B-3 and B-8, and coated in accordance with ASTM B33 (tin coated) , must be furnished.
- (b) Size. The stranded conductor must consist of stranded wires twisted with an appropriate lay to form a No. 16 AWG conductor with an approximate diameter of 0.048 inches.

### **INSULATION**

6. (a) Type. The insulation must be an easily strippable low smoke zero halogen (LSZH) thermosetting polyolefin compound or ethylene propylene rubber (EPR), or equal meeting or exceeding the requirements of ICEA S-95-658 and the additional requirements of this specification.

(b) Rating. The insulation must be rated for continuous duty at 90°C in accordance with U.L. AWM Style 3400.

(c) Thickness. The insulated conductor must be circular in cross-section, concentric to the conductor, with a nominal insulation thickness of 0.031 inches (2/64") and a minimum spot thickness of 90% of the nominal thickness.

(d) Initial Physical Requirements:

- |                                  |       |
|----------------------------------|-------|
| 1. Tensile strength, min., PSI   | 1,600 |
| 2. Elongation at rupture, min. % | 250   |

(e) Air Oven Exposure Test. After conditioning in an air oven at 158 ± 1°C for 168 hours using methods of test described in ASTM-D 573:

- |  |     |
|--|-----|
| Tensile strength, minimum percent of unaged 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± 1°C:
- |   |     |
|---|-----|
| Water absorption, maximum, milligrams per square inch . . . | .50 |
|---|-----|

(g) Cold Bend Test Requirements. The completed cable must pass the "Cold-Bend," Long-Time Voltage Test on Short Specimens of ASTM D-470 except that the test temperature must be minus (-) 25°C.

(h) Electrical Requirements:

1. Voltage Test. The completed cable must meet an A.C. and D.C. voltage test in accordance with ASTM D-470 and D-2655.
2. Insulation Resistance. The completed cable must have an insulation resistance constant of not less than 20,000 when tested in accordance with methods shown in ASTM D-470.

(i) Flexibility Tests. A sample length of insulated conductor must be formed in a loose coil, placed in a circulating air oven, and aged for 168 hours at 158° C ± 1°C. The sample must then be allowed to cool to room temperature for one (1) hour and tightly wrapped around a 3X metal mandrel. The sample must show no cracks and must pass the same voltage test specified for the "Cold-Bend Test."

**JACKET**

7. (a) Type. The jacket must be a thermosetting low smoke zero halogen (LSZH) polyolefin compound or chlorinated polyethylene (CPE), or equal meeting the physical and electrical requirements specified herein.
- (b) Rating. The jacket must be rated for continuous duty at 90° C.
- (c) Thickness. The jacket must be circular in cross-section, concentric with the insulation, must have an average thickness not less than 45 mils and a spot thickness not less than ninety percent (90%) of the average thickness.
- (d) Initial Physical Requirements:
- |    |  |      |
|----|--|------|
| 1. | Tensile strength minimum PSI           | 1800 |
| 2. | Elongation at rupture, minimum percent | 300  |
- (e) Air Oven Exposure Test. After conditioning in an air oven at 121 ± 1°C for 168 hours for LSZH or 136 ± 1°C for CPE:
- |    |   |    |
|----|---|----|
| 1. | Tensile strength, minimum percent of unused value       | 75 |
| 2. | Elongation at rupture, minimum percent of unaged valued | 55 |
- (f) Mechanical Water Absorption. After 168 hours at 70 ± 1° C:
- |    |                                     |    |
|----|-------------------------------------|----|
| 1. | Milligrams per square inch, maximum | 20 |
|----|-------------------------------------|----|

**TESTING**

8. (a) General. Tests shall be performed on insulation, jacket and completed cables in accordance with applicable standards as listed in this specification. Where standards are at variance with each other or with other portions of this specification, the most stringent requirements, as determined by the Engineer of Electricity will apply.

All tests must be conducted on cable produced for this order. Where cable insulation and/or jacket thickness preclude obtaining samples of sufficient size for testing, special arrangements must be made with the engineer to obtain samples of unprocessed materials directly from the extrusion feed bins which will be separately processed and prepared for tests.

- (b) Number of Tests. Insulation and jacket tests must be conducted on samples taken every 25,000 feet or fraction thereof of each conductor size. In no case must samples be taken closer than 15,000 feet apart.
- (c) Test Reports. No cable shall be shipped until certified copies of all factory tests have been reviewed and approved by the engineer.
- (d) Acceptance. Samples shall be taken from each reel and must successfully conform to all tests specified herein. Reels from which samples fail to conform, will be rejected.

### **PACKAGING**

- 9. (a) Reels. The completed cord shall be delivered on sound, substantial reels. The ends of the cable must be securely fastened so that they will not become loose during shipment and handling.
- (b) Footage. The number of feet per reel must be five hundred (500) feet plus or minus ten percent ( $\pm 10\%$ ).
- (c) Marking. A metal tag, or an approved indelible marking material such as alkyd enamel paint, must be used to mark the reel. The marking information must include, but not be limited to, the following: reel number, contract number, a description of the cord, and the footage of that particular reel.

**ELECTRICAL SPECIFICATION 1493  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
REVISED JANUARY 27, 2010**

**TRAFFIC SIGNAL: VEHICULAR, TWELVE-INCH SINGLE FACE, SINGLE OR  
MULTIPLE-SECTION, POLYCARBONATE, LED OR INCANDESCENT**

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**1. GENERAL REQUIREMENTS**

- 1.1 This specification states the requirements for twelve-inch, single face, single and multiple-section, traffic signals with polycarbonate housings, using 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 Division of Electrical Operations, 2451 South Ashland Avenue, Chicago, Illinois 60608.
- 1.3 Standards. Equipment furnished under this specification shall meet the appropriate requirements of the following standards, as required within the body of this specification:
- American Association of State Highway and Transportation Officials (AASHTO)
  - American Society for Testing and Materials (ASTM)
  - Institute of Transportation Engineers (ITE)
  - National Electrical Manufacturers Association (NEMA)
  - Underwriters Laboratories (UL)
- 1.4 Approval. Approval will mean approval in writing by the Commissioner or his duly authorized representative.

- 1.5 Warranty. The manufacturer shall warrant the signals to meet the requirements of this specification, and shall warrant all equipment, components, parts and appurtenances against defective design, material and workmanship for a period of three (3) years from date of acceptance. In addition, LED optical units must carry a seven (7) year warranty against failure or loss of color (chromaticity) and signal brightness (luminance) below minimum acceptable VTCSH standard levels from date of final acceptance for contract construction, or date of delivery on a specific order. In the event defects or failures occur in the LED units during the warranty period, the manufacturer must replace all defective units, at no expense to the City. This warranty shall be evidenced by a letter or certificate of warranty submitted to the City at the time delivery is made. The LED warranty must cover all units delivered in an order or installed by contract, and must include unit serial numbers. The warranty must be signed and dated by an official of the manufacturer who is empowered by the manufacturer to enter into such a warranty.
- 1.6 Location. The supplier of the LED modules shall actively maintain an office, stocking warehouse, and technical support within a 100 mile radius of the City of Chicago.

**2. MATERIALS AND EQUIPMENT REQUIREMENTS**

- 2.1 The traffic signal heads shall conform to ITE Standard "Vehicle Traffic Control Signal Heads" (VTCSH), in which the most recently published revision will govern.
- 2.2 Housing. The housing of each section must be one piece, ultraviolet stabilized polycarbonate resin of the specified color, injection molded complete with integral top, bottom, and sides, having a minimum thickness of 0.1 inch.
- (a) The polycarbonate shall meet or exceed the following tests:

<b>TEST</b>	<b>REQUIRED</b>	<b>METHOD</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-lbs/in.	ASTM D 256
Fatigue strength (at 2.5 mm cycles)	950 PSI min.	ASTM D 671

- (b) Assembly. A traffic signal section shall be comprised of, but not limited to, the housing, hinged door, visor, optical unit and all necessary gaskets and hardware. The multi-section, single face, traffic signal shall be comprised of single face single sections assembled together, containing an internally mounted terminal block. Arrow indications must be shipped as single sections. The traffic signals shall be designed and constructed to permit sections to be assembled together, one above the other, forming a weatherproof and dust-tight unit.
- (c) Individual sections shall be fastened together with a coupling washer assembly composed of two washers, three zinc plated bolts, nuts, and lock washers which lock the individual sections together. As an alternative, individual sections may be fastened together with four cadmium plated bolts, lock washers, and nuts. The hole in the coupling washer assembly must accommodate three 3/4 inch cables.
- (d) Height. The overall height of an assembled traffic signal must be fourteen (14) inches for a single-section signal, forty-two (42) inches for a three-section signal, and seventy (70) inches for a five-section, plus or minus one (1) inch.
- (e) Mounting. The traffic signal shall be designed for mounting with standard traffic signal brackets using 1-1/2 inch pipe size fittings.
- (f) Positioning Device. The top and bottom opening of each housing must have integral serrated bosses that will provide positive positioning of the signal head in five degree increments. A total of 72 teeth must be provided in the serrated bosses to allow the signal face to be rotated 360 degrees about its axis. The teeth shall be clean and well defined to provide positive positioning.
- (g) Hinges. The signal housing shall be sectional; one section for each optical unit. Each housing must have four integral hinge lugs, with stainless steel hinge pins (AISI 304 or equivalent), located on the left side for mounting the door. The hinge pins shall be straight and not protrude past the outside of the housing lugs. The housing must have two integral latching bolt lugs on the right side each with a stainless steel hinge pin to which a latching bolt (AISI 304 or equivalent), washer, and wing nut will be attached. The wing nuts must be captive. Each housing must be equipped with holes to be used for mounting backplates.



- (h) Door. The door shall be a one piece ultraviolet stabilized polycarbonate resin of the specified color, injection molded complete with a minimum thickness of 0.1 inch. Two (2) hinge lugs on the left side and two (2) sets of latch screw jaws centered on the right side, as viewed from the front of the signal, must be integrally cast with the housing door. The door must be hinged to the housing with two (2) stainless steel hinge pins, drive fitted. Two (2) stainless steel latch screws and wing nut and washer assemblies on the latch side of the housing body shall provide for opening and closing the door without the use of tools. The door must have eight (8) holes with threaded metal inserts for stainless steel machine screws to secure the visor(4 holes) and the lens(4 holes). The inside of the door must be grooved to accommodate a one piece, air-cored EPDM (ethylene propylene diene monomer) gasket to provide a weatherproof and dust proof seal when the door is closed. The inside of the door must have four equally spaced threaded metal inserts for the lens attachment. The outside of the door must have an integral rim completely encircling the lens opening to prevent leakage between the door and the lens. The rim must have four equally spaced tabs around the circumference with threaded metal inserts for the visor.
- (i) Visor. Each traffic signal shall have a visor for each signal indication (section). The visor shall be the tunnel type, nine and one-quarter inches (9-1/4") long, fabricated of ultraviolet stabilized polycarbonate resin of the specified color, injection molded. The visor shall fit tightly against the door and not permit any light leakage between the door and visor. All hardware necessary for, but not limited to, attachment of the visor must be of stainless steel. The visor must have four mounting lugs for attaching the visor to the door. Screws must go through the visor lugs into the metal inserts in the door to secure the visor.

2.3 The traffic signal heads shall be provided with incandescent or LED optical units as specified in the line item or Contract Plans.

#### 2.3.1 INCANDESCENT OPTICAL UNITS

- (a) Incandescent Optical Unit. The incandescent optical unit consists of the lens, reflector and lamp holder. The optical unit and visor shall be designed as a whole so as to eliminate the return of outside rays entering the unit from above the horizontal (known as sun phantom). The optical unit shall be designed and assembled so that no light can escape from one indication to another.

- (b) Lenses. The red, yellow and green polycarbonate lenses must be round with a nominal twelve (12) inch diameter and shall conform to all requirements set forth under the heading "Traffic Signal Lenses" in the ITE standard. The red, green or yellow arrow lenses must be round with a nominal twelve (12) inch diameter and the outside surface must be covered, except for the arrow, with a dull or dark grey opaque material of a thickness sufficient to totally hide the light from a 2000-lumen lamp placed behind it operating at rated voltage. The opaque material shall be hard and durable and shall be bonded such that it will not peel or flake when subject to the heat of a signal lamp or when the lens is washed. The shape and size of the arrow shall be of an approved design with a minimum stroke of fifteen-sixteenths (15/16) inch. The arrow shall appear uniformly illuminated when viewed from angles usually encountered in service, whatever may be the angular position of the lens in the signal section. The lens must be enclosed by an air-cored EPDM (ethylene propylene diene monomer) gasket providing a weather proof and dust proof seal between the lens, door, and reflector assembly. The gasketed lens must be secured to the housing door by four (4) stainless steel screws (AISI 304 or equivalent) and clamps equally spaced around the lens opening. The door must have threaded metal inserts to receive the screws.
- (c) Reflector. The reflector shall be fabricated of high-purity, clad-type aluminum sheet formed to a parabolic shape and cut to fit in a circular polycarbonate, hinged frame for rigid mounting within the housing. The circular rim of the reflector shall be mounted in such a way as to seal the internal optical system by being compressed against the lens gasket when the signal door is closed. The reflecting surface must be an "ALZAK" class SI specular finish having a minimum reflectivity of eighty-two (82) percent and a protective oxide coating of 7.5 milligrams per square inch, minimum. The reflectivity shall be determined with a Taylor-Baugartner Reflectometer, and the weight of the protective oxide coating by the method of test outlined in ASTM B 137. The reflecting surface must be tested for proper sealing by applying one (1) drop of a water solution (1 gram per 50 cc) of Anthraquinone Violet R at a room temperature. After five (5) minutes, the dye must be washed from the surface with running water. No stain must remain after the surface is lightly rubbed with a soft cloth wet with mild soap and water, and rinsed with water. The reflector must have an opening in the back to accommodate the lamp holder.

- (d) Lamp Holder. The lamp holder must have a heat, moisture and weatherproof molded phenolic housing designed to accommodate a standard 133 watt, 3 inch light center length, incandescent lamp. The lamp holder shall be so designed that it can be readily rotated and positively positioned to provide proper lamp filament orientation and focus. The inner brass shell, or ferrule, of the lamp holder must have a grip to prevent the lamp from working loose due to vibration. A gasket must be furnished at the junction of the lamp holder and the reflector.

### 2.3.2 LIGHT EMITTING DIODE (LED) OPTICAL UNITS

- (a) Light emitting diode (LED) optical units shall consist of an integral unit containing the following components: power leads, housing, integral lens, matrix of light emitting diodes (LEDs) emitting monochromatic light of desired signal color, and electronic and electrical components necessary to permit operation at nominal 120 volt, 60 hertz power.
- (b) The LED unit shall be of such dimensions as to permit mounting in any standard traffic signal housing, be interchangeable with incandescent optical units, and must include appropriate gasket for this purpose. Gasketing provided must provide a watertight seal meeting existing ITE standard for signal heads, and exclude the infiltration of moisture into either the signal housing or into the LED optical unit case.
- (c) The LED unit shall meet the applicable requirements of the ITE standards for Vehicle Traffic Control Signal Heads(VTCSH) Part 2: LED Vehicle Signal Modules, for color (chromaticity), signal brightness (luminance), and beam spread (luminance at various vertical and horizontal angles). Yellow LED modules shall meet the green module requirements for brightness.
- (d) Minimum brightness of LED signal units shall be in accordance with the luminous requirements in a standard testing procedure as defined by Section 4 of the VTCSH Part 2: LED Vehicle Signal Modules. During the required operating life of LED signal units, the luminance output of the units must not be less than 60 percent (.60) of the values specified in the standard.
- (e) Unit lenses must be twelve inches in diameter and be constructed of ultraviolet (UV) stabilized, impact resistant polycarbonate, acrylic or other approved material. Lenses shall be clear or tinted.
- (f) Units shall consist of LEDs uniformly distributed to present a homogeneous appearance on the face of the lens from a wide viewing angle.

- (g) LEDs shall be wired so that the loss of a single LED or a string of LEDs will not reduce the luminescence below the minimum requirement.
- (h) For purposes of this specification, failure of a single unit is defined as an occurrence where the luminescence of the signal measured in candela in standard test procedures is less than the required initial luminance or luminance at time points and conditions specified, or where minimum required brightness is achieved, but two or more series strings of LEDs or in excess of twenty percent of 20% of LEDs are not operable.
- (i) Unit power supply shall be constant current regulated and filtered to provide instant on indications, and to prevent momentary signal outages or flicker. Units must be fully operable over a range of 90 volts to 130 volts at 60 hertz, plus or minus 3 hertz.
- (j) Surge protection: Each unit must be provided with integral surge protection to withstand transient of 600 volt, 100 microsecond rise and 1 millisecond pulse width. The surge protector shall provide full electrical and physical protection to all unit components.
- (k) Maximum permissible power consumption at ambient conditions (nominal 120 volts, 60 hertz, 70 degrees F.) must be 30 watts at a minimum 90 percent power factor. Power consumed must not vary by more than ten (10) percent from nominal power consumption over voltage range of 105 volts to 125 volts, and over permissible environmental ranges.
- (l) Units must be fully operable at temperature ranges of -40 degrees F. (-40 deg C) to +165 degrees F. (+74 deg C) at up to 100 percent relative humidity.
- (m) Units shall be clearly marked on the back surface of the unit in a permanent manner showing information required for warranty and long term performance. Information to be shown must include manufacturer name, date of manufacture, electric power requirements, signal model type including color and indication type, and signal serial number.
- (n) The LED unit shall be compatible with the traffic signal controller equipment currently in use by the City of Chicago, and meeting the City's latest specifications for traffic signal control equipment. In particular the LED unit shall be compatible with the NEMA TS-1 and later traffic signal load switches and conflict monitors.
- (o) Units shall meet applicable sections of Title 47, SubPart B, Section 15 of the Federal Communications Commission (FCC) rules as applies to electronic noise limitation and electromagnetic interference.

- (p) Total harmonic distortion (THD) induced into the voltage and current AC power line sine waves must not exceed 20 percent.
- (q) LED optical units must meet the requirements of VTCSH Part 2: LED Vehicle Signal Modules Section 6.3.1 for signal burn-in.

2.4 Wiring. Each lamp holder must be furnished with two (2) leads color coded as follows:

White	Common
Red	Red Lens Section
Yellow	Yellow Lens Section
Green	Green Lens Section
Green with Black Tracer	Green Arrow Lens Section
Yellow with Black Tracer	Yellow Arrow Lens Section
Red with Black Trace	Red Arrow Lens Section

The lead must be type TEW No. 18 AWG stranded copper wire with 2/64 inch thick, 600 volt, 105 degree centigrade rated, thermo-plastic insulation meeting MIL-W-76A specifications. The lead must connect to the terminal strip without being spliced. The ends of the lamp leads must be stripped of one-half inch (2") of insulation and tinned.

- 2.5 Terminal Strip. A dual-point, barrier type terminal strip with a solid base and pressure plate type connectors shall be securely attached at both ends to the housing body inside the "Green" section of the signal head.
- 2.6 Cable. One, eleven foot (11') length of flexible electric cord, medium duty, type SO, No. 16 AWG stranded copper conductor, color coded, rubber insulated, neoprene jacketed, must be furnished with each signal head. The number of conductors must include neutral, ground, and one switch leg for each section. Both ends of each cable length must be carefully stripped of six inches (6") of jacket and one inch (1") of insulation, and each conductor properly tinned.
- 2.7 Gaskets. Wherever necessary to make a completely dustproof, moistureproof and weatherproof assembly of the housing and optical system, approved type gaskets of neoprene or silicone rubber shall be provided.

### **3. TESTING AND DOCUMENTATION REQUIREMENTS**

- 3.1 Documentation. The contractor shall provide certified manufacturing and testing documentation to demonstrate that the traffic signals being supplied meet or exceed the specification requirements. All LED Optical Units shall be tested by a nationally recognized testing laboratory (NRTL), such as Intertek (ETL), to demonstrate compliance with the latest ITE VTCSH specification. All LED units shall have the testing laboratory's label attached.

3.2 Inspection. The signals shall be subject to inspection at the discretion of the Commissioner. Final inspection shall be made at point of delivery. Any signal rejected shall be removed and disposed of by the contractor at his sole cost.

**4. PACKING**

4.1 Packing. Each traffic signal assembly shall be packed in a suitable carton so secured that the signal will not be damaged during shipment, handling or storage.

4.2 Marking. Each carton containing a traffic signal shall be clearly marked on the outside in letters not less than three-eighths (3/8) inch tall with the legend: "TRAFFIC SIGNAL, TWELVE-INCH, POLYCARBONATE@ or ATRAFFIC SIGNAL, TWELVE INCH, POLYCARBONATE, LED OPTICS@and the number of Sections as required, the color and indication types, the name of the manufacturer, the date of manufacture, the pertinent Contract Number and the appropriate City Commodity Code Number.

**ELECTRICAL SPECIFICATION 1494  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
REVISED JANUARY 27, 2010**

**PEDESTRIAN TRAFFIC SIGNAL, 16 INCH WITH SYMBOLIC LED WALK/DON'T  
WALK LENSES POLYCARBONATE HOUSING**

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**SCOPE**

1. This specification states the requirements for a single section pedestrian 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 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) Warranty. The manufacturer shall warrant the signals to meet the requirements of this specification, and shall warrant all equipment, components, parts and appurtenances against defective design, material and workmanship for a period of three (3) years from date of acceptance. In addition, LED optical units must carry an additional warranty against failure or loss of color (chromaticity) and signal brightness (luminance) below minimum acceptable PTCSI standard levels for a period of seven (7) years from date of final acceptance for contract construction, or date of delivery on a specific order. In the event defects or failures in the LED units occur during the warranty period, the manufacturer must replace all defective units at no expense to the City. This warranty shall be evidenced by a letter or certificate of warranty submitted to the City at the time final delivery is made. The warranty must cover all units delivered in an order or installed by contract, and must include unit serial numbers for all LED units. The warranty must be signed by an official of the manufacturer who is empowered by the manufacturer to enter into such an agreement.
- (e) 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**

- 3. (a) The pedestrian signal heads shall conform to ITE Standard "Pedestrian Traffic Control Signal Indications" (PTCSI), in which the most recently published revisions 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.
- (c) 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.	-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 D 732	5,500 PSI min.	ASTM
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

**EQUIPMENT REQUIREMENTS**

4. (a) 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 shall accommodate standard 1 2" pipe fittings and brackets.
- (b) 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.

- (c) 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 shall 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 for the visor attachment.

### **LED OPTICAL UNIT**

5. (a) LED Optical Unit. Light emitting diode (LED) optical units shall consist of an integral unit containing the following components: power leads, housing, integral lens, matrix of light emitting diodes (LEDs) emitting monochromatic light of desired colors, and electronic and electrical components necessary to permit operation at nominal 120 volt, 60 hertz power. All units must form a neat compact unit within the housing body with no light leakage between the door and the housing body, and the signal indication and the visor.
- (b) The LED unit shall meet the applicable requirements of the VTCSH 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 must 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° F.) must be 18 watts at a minimum 90% 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° F. (-40° C) to +165° F. (+74° C) at up to 100% 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 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.

- (m) 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.
- (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.

**SYMBOLIC MESSAGE**

- 6. Symbols for "Walk" (Man) and "Don't Walk" (Hand) shall conform in style and color to those of the "Institute of Transportation Engineers" (I.T.E.). The messages shall be approximately 16 inches square and display the "Don't Walk" and "Walk" symbols. The symbols shall be applied in such a manner as to provide an opaque polycarbonate background and illuminated legends. 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 lunar white, conforming to the specifications of the PTCSI.

**LENS**

- 7. The unit lenses shall be constructed of ultraviolet (UV) stabilized , impact resistant polycarbonate, acrylic or other approved material. Lenses must be anti-glare, smooth texture, and clear.

**WIRING**

- 8. (a) Each lamp holder must have 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, thermo-plastic insulation meeting MIL-W-76Aspecifications. 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 shall 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 two (2) section 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.

**TESTING AND DOCUMENTATION REQUIREMENTS**

- 9. (a) Documentation. The contractor shall provide certified manufacturing and testing documentation to demonstrate that the pedestrian 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 shall 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.

**PACKING**

- 10. (a) 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 inch (3/8") tall with the legend: "PEDESTRIAN SIGNAL, SIXTEEN-INCH, SYMBOLIC LED WALK-DON'T WALK," the appropriate City Commodity Code Number, the name of the manufacturer, the date of manufacture, and the pertinent contract number.

**ELECTRICAL SPECIFICATION 1495  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
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 Division of Electrical Operations, 2451 South Ashland Avenue, Chicago, Illinois 60608.
- (b) Standards. Equipment furnished under this specification must meet the appropriate requirements of the following standards, as required within the body of this specification:

American Association of State Highway and Transportation Officials  
(AASHTO)

American Society for Testing and Materials (ASTM)  
Institute of Transportation Engineers (ITE)  
National Electrical Manufacturers Association (NEMA)

- (c) Approval. Approval will mean approval in writing by the Commissioner or his/her duly authorized representative.

- (d) Warranty. The manufacturer shall warrant the signal bracket to meet the requirements of this specification, and shall warrant all equipment, components, parts and appurtenances against defective design, material and workmanship for a period of three (3) years from date of acceptance. In the event defects and failures become apparent during this period, the manufacturer must replace the defective brackets at no expense to the City. This warranty must be evidenced by a letter or certificate of warranty submitted to the City at the time final delivery is made.

**MATERIAL**

3. (a) The bracket must be one piece, ultra violet stabilized polycarbonate resin of the specified color, injection molded complete with integral top, bottom, and sides.
- (b) The polycarbonate formulation used must provide these physical properties (Tests may be performed on separately molded specimens).

<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.

**ELECTRICAL SPECIFICATION 1500  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO**

**REVISED SEPTEMBER 19, 2001**

**TEARDROP LUMINAIRE, HORIZONTAL LAMP, FOR CHICAGO 2000 POLE;  
250/310 WATT HIGH PRESSURE SODIUM LAMP; I.E.S. TYPE III DISTRIBUTION**

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**SUBJECT**

1. This specification states the requirements for a type III teardrop style street lighting luminaire with integral ballast and electronic components, and a 250 or 310 watt high pressure sodium lamp. The luminaire must include fitter and must be fabricated for attachment to a 2" O.D. and 8' long steel mast arm on a Chicago 2000 light pole.

**SUBMITTAL INFORMATION REQUIRED**

2. (a) Manufacturer=s Shop Drawings and Product Data. The contractor must submit scaled manufacturer=s shop drawings showing actual luminaire dimensions, description, weight, and EPA. Shop drawings must be original drawings created by the manufacturer; photocopied or scanned copies of the Standard Drawings will not be accepted, and will be considered rejected as an incomplete submittal. These drawings will also be submitted in electronic format in Microstation 95, if requested. The contractor must also submit manufacturer=s catalog cut sheets showing luminaire designation(s), characteristics, and catalog number(s). Also, manufacturer=s catalog cut sheets for all electrical components including lamp, ballast, capacitor, ignitor, lamp holder, terminal blocks, fuse holders and fuses, and wiring.  
  
(b) Photometric Calculations and Data. Submittal must include the following:

1. Candlepower distribution curve showing the light distribution in the 70 degree cone and in a vertical plane through the maximum beam.
2. Isofootcandle chart of horizontal foot candles.
3. Utilization efficiency charts and luminaire efficiency tables.
4. Luminaire classification per ANSI designation.
5. Candlepower values at every 5.0 degree intervals.
6. Candlepower tables in I.E.S. format in electronic format.
7. Luminaire manufacturer and catalog number in photometric test report.

(c) Certified Test Reports and Statements. Contractor must submit certified test reports as required in this specification.

(d) Contractor must provide manufacturer's written instructions and maintenance manuals for luminaire.

(e) Sample. If requested by the Chief Procurement Officer, one completely assembled luminaire with fitter and integral components, of the manufacture intended to be furnished, must be submitted for review within fifteen (15) business days of receipt of such notice.

(e) Warranty. The manufacturer must 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 three years after delivery. This will be interpreted particularly to mean compatible performance of ballast with lamps of various manufacture, failure of any ballast component, loss of reflectivity of any reflecting surface, and discolorations or fogging of any portion of the optical system impairing the transmission of light. The reflector, the refractor or lens, and the entire optical assembly must not develop any discoloration over the normal life span of the luminaire. An extended warranty of seven years, over and above the normal warranty, must be furnished by the manufacturer pertaining to the above said discoloration. The extended warranty must be furnished in writing guaranteeing replacement, including shipment, free of charge to the City, of any optical assembly, or any component parts thereof, which, as determined by the

Commissioner, would develop aforesaid discoloration. The extended warranty must accompany submittal information. Any luminaire or part thereof not performing as required or developing defects within this period, must be replaced by the manufacturer at no cost to the City. The Commissioner will be the sole judge in determining which replacements are to be made and the Commissioner=s decision will be final. Any cost for the warranty as specified will be incidental to this contract.

### **GENERAL**

8. (a) Assembly. Each luminaire must be delivered completely assembled, wired, and ready for installation; without the lamp. It must consist of the cast housing, refractor, and fitter as shown on Department of Transportation Standard Drawing 931; reflector, lamp holder assembly, terminal block, fusing, ballast components, gaskets, and all necessary hardware.

(b) Approval. Whenever Approval and Approved are used in this specification they will mean a written approval by the Commissioner to be secured prior to proceeding with manufacture of these luminaires.

(c) Commissioner=s Review. The Commissioner will be the sole judge in determining the submitted luminaires compliance with this Specification. The Commissioner=s decision will be final.

### **CAST HOUSING AND FITTER**

4. (a) Material. Each housing and fitter must be cast aluminum, ASTM Grade 356, conforming to the Aluminum Association Standards for Aluminum Sand and Permanent Mold Castings, Washington, D.C., March 1980.

(b) Construction. The housing and fitter must conform in detail and dimensions to Standard Drawing 931. Each casting must be made by the permanent mold process; sand castings will not be acceptable. Minimum thickness will be 3/16", excluding the fitter attachment to the pole, and will be uniform within each casting and throughout all castings in an entire order. Inconsistencies in casting thickness will be cause for rejection of the entire lot.

(c) Appearance. Castings will have smooth external surfaces free from protuberances, dents, cracks, or other imperfections marring their appearance. Welding or plugging of casting defects is prohibited. The housing will be of a similar design as manufactured by Lumec Inc., Luminaire Catalog Series RN20. The fitter will be of a similar design as manufactured by Lumec Inc., RN20 Style Catalog # LMS14343A. Similar designs must be approved by the Commissioner. The Commissioner's decision of what constitutes a similar design will be final.

(d) Housing. The housing must enclose the lamp socket, reflector, terminal block, fuse holder(s) and ballast components, with provision for proper mounting of these parts. The housing must be of such size and surface area, or must have a heat sink characteristics, such that all enclosed components will operate within their designed operating temperatures under expected service conditions.

(e) Fitter. The fitter attachment to the pole mast arm must provide the structural integrity to hold the luminaire firmly in place during the vibrations anticipated due to wind loading, passing elevated trains and heavily loaded vehicles. Two 3/8-16, stainless steel (type 304) U-shape bolts must be used to secure the fitter to the pole mast arm. A minimum of 3/4" thickness of metal will be provided where the U-bolts are inserted to minimize the possibility of stripping the threads when the hardware is tightened into place. The hardware must include 3/8" x 16 threaded, stainless steel washers and nuts; four sets of nuts and washers must be provided where cobra-head style leveling device and fitter attaches to mast arm. The U-bolts must be properly installed and torqued in accordance with the manufacturer's written installation instructions. The fitter must be securely threaded into the cast housing such that it will remain an integral part of the luminaire during the vibrations described above.

**CAST HOUSING AND FITTER PAINTING**

5. (a) Oil and Grease Removal. All metal surfaces must be washed with an alkaline detergent to remove any oils or grease.
- (b) Chemical Pretreatment. The cleaned metal surfaces must be rinsed with de-ionized water, treated with a hot, pressurized phosphate wash and sealer, rinsed again with de-ionized water, and then 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 four mil thickness in a one coat application. This powder coat must be cured in a convection oven at a minimum 400°F 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 must be capable of passing 1,000 hours of salt spray exposure as per ASTM B117 in a 5% Na Cl (by weight) solution at 95°F and 95% relative humidity without blistering. Before 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" must be not less than 3.0 mils.
- (g) Color. Preferred color will be gloss black. A 4" square color chip sample must be submitted for approval prior to fabrication. The chip sample must be of the same material as the capital, and must include the manufacturer's name and the manufacturer's color name as well. The sample must also include any other information which will be required to purchase the same color for the poles and split pedestal bases. Preferred color will be equal to Morton Powder Coat #20-7345.

**ACRYLIC REFRACTOR**

6. (a) Material/Construction - The refractor must be molded of clear, UV resistant V825 HID acrylic resin. The refractor exterior must be smooth to shed dirt and pollutants. Any prismatic necessary must be on the interior of the refractor. The refractor will be of a similar design as manufactured by Lumec Inc. Catalog # RN20-AC.
- (b) Appearance - The refractor must conform to that shown on Department of Transportation Standard Drawing 931.
- (c) Refractor Mounting - The refractor must be mounted by means of a hinge assembly with stainless steel, captive screws mounted into the cast aluminum fixture housing. An asymmetric refractor will be clearly marked and keyed AHOUSE SIDE@ and A STREET SIDE@, so that it will be properly installed to provide the required photometrics. The mounting will afford the rigidity necessary to prevent the refractor from twisting or rattling when subjected to the vibrating forces of wind loading, passing elevated trains or heavily loaded vehicles. Mounting will include bolt torquing in accordance with the manufacturer=s written installation instructions. The mounting must not preclude any refractor from being mutually interchangeable with any other refractor intended for this function.

**ELECTRICAL COMPONENTS**

7. (a) Lamp Holder. The lamp holder must be a glazed porcelain lamp-grip socket, mogul base, with a nickel-plated shell and spring loaded center contact rated for a minimum of 4KV pulsing. It must be a street lighting grade, commercially available product. The lamp holder must be properly secured in the factory and must not require field adjustment for optimum photometric performance.

(b) Terminal Block and Fusing. A divisible-type terminal block of molded phenolic plastic must be provided within the housing in a readily accessible location. 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 the factory-provided fuse holder(s) which take "small dimension" (13/32" x 1-1/2") cartridge fuses. The fuse holder(s) must be standard, 600 volt fuse holder(s) with bayonet-type knob, and must be factory-wired to the appropriate terminals. 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) Ballast Requirements.

1. General. The integral ballast must be a constant wattage autotransformer (CWA) type. It must be designed to furnish proper electrical characteristics for starting and operating a 310 watt, type LU high pressure sodium lamp at temperatures as low as minus 40°F ( for a 250 watt fixture, the ballast must operate a 250 watt lamp). The ballast winding must be adequately impregnated and treated for protection against the entrance of moisture, insulated with Class G insulation and able to withstand the NEMA standard dielectric test. The ballast must include an electronic starting component. Ballast must be CWA Quad Volt, Advance Catalog #71A8391 or equal, for 120 volt, 208 volt, 240 volt, or 277 volt operation.

2. Lamp Operation. The ballast must provide positive lamp ignition at an input voltage of 95 volts at 120 volts nominal, 190 volts at 208 volts nominal, and 190 volts at 240 volts nominal. It must operate the lamp over a range of input voltage from 95 to 125 volts for the 120 volt tap, from 190 to 220 volts for the 208 volt tap, and from 220 to 254 volts for the 240 volt tap, without damage to the ballast. It must provide lamp operation within lamp specifications for rated lamp life at input voltages between 106 volts and 122 volts for the 120 volt tap, between 198 volts and 218 volts for the 208 volt tap, and between 228 volts and 252 volts for the 240 volt tap.



3. Rating. The ballast must have non-fading, color coded wire leads for rated input voltage of 120 volts, 208 volts, or 240 volts at 60 cycles, which must drive a nominal 100 volt lamp at 310 watts ( for the 250 watt fixture, the ballast must drive a nominal 100 volt lamp at 250 watts). The design range of input voltage for this ballast must be from +6% to -8% of the nominal voltage.

4. Lamp Current. The ballast must supply a nominal 3.6 amperes to a 310 watt, 100 volt high pressure sodium lamp, in accordance with the lamp manufacturer=s recommendations, during operation and a maximum of 5.5 amperes at starting. For the 250 watt fixture, the ballast must supply a nominal 2.2 amperes to a 250 watt, 100 volt high pressure sodium lamp during operation and a maximum of 3.0 amperes at starting.

5. Power Factor. The power factor of the ballast over the design range of input voltages specified above must not be less than 90%.

6. Line Current. With nominal input voltage applied, the input current under starting, short circuit, or open circuit condition, must not exceed 3.37 amperes rms at 120 volts nominal, 1.94 amperes rms at 208 volts nominal, and 1.68 amperes rms at 240 volts nominal.

7. Lamp Wattage. The ballast must deliver either 250 watts or 310 watts to a horizontal burning nominal (100 volt) lamp when operating at the nominal input voltage. Wattage input to the nominal (100 volt) lamp must not vary more than a total of 30% over the input voltage design range specified above.

8. Ballast Loss. Wattage loss of the ballast must not exceed 62 watts when delivering 310 watts to a nominal (100 volt) lamp at the nominal input voltage. Wattage loss of the ballast must not exceed 45 watts when delivering 250 watts to a nominal (100 volt) lamp at the nominal input voltage. The wattage loss will be measured with a nominal 100 volt lamp "hot" in the fixture.

9. Short or Open Circuit. The ballast must be capable of sustaining short circuit or open circuit conditions for extended periods without damage to ballast components, including the electronic starter.

(d) Ignitor. The ignitor must be of a similar design as manufactured by Payne Sparkman Manufacturing Incorporated, Catalog No. ULI-100S, which directs the voltage spike directly to the lamp without being directed through the ballast windings. It must provide a low energy, high voltage surge to the lamp for initial ignition with a duration of one microsecond minimum within 20 degrees of peak voltage of the sine wave. The voltage surge or spike, must have a minimum amplitude to 2,300 volts. The ignitor must be totally epoxy encapsulated in a metal can and used with all brands and types of 60 Hz HPS ballasts. The unit must be burned in for 48 hours with power applied at elevated temperatures and with constant monitoring of case isolation. A proposed equal ignitor must have a documented non-failure rate equal to that of the Payne Sparkman product.

(e) Crest Factor. Current crest factor must not be greater than 1.8 at nominal input voltage for a nominal horizontal burning lamp.

(f) Mounting. The ballast components must be mounted and fastened on the component mounting plate or tray in a manner such that the components will remain secure and capable of withstanding the vibrations and shocks likely to occur when installed and in service. These components must be readily removable for replacement. All ballast components must be mounted to a single galvanized steel plate, which will be secured to the housing by a sliding captive rail system or other approved method. When the ballast housing door is opened, the entire assembly will be removed from the housing by sliding out the assembly and lifting it off of the captive position. Each component must be readily removable for replacement. Quick disconnects must be provided for this purpose. The ignitor will be of a plug-in type for easy removal. Alternate methods may be considered.

(g) Capacitor. The capacitor must be an A.C. voltage, paper, non-PCB impregnated, 80°C temperature rated, power capacitor. Its physical size and location within the luminaire must be such that the case temperature of the capacitor must not exceed 80°C after ten hours of continuous operation of the luminaire in an ambient temperature of 30°C.

(h) Noise Level. The noise level of this ballast must be such that when installed in the luminaire and operating, no objectionable audible or radio noise will be detected from directly beneath the luminaire when field tested in the actual installation and mounted on a steel pole at a 30' light center height.

(i) Measurements and Tests. Measurements and tests, where required, must be made with a nominal lamp burning in the luminaire and the ballast operating at a stabilized temperature.

(j) Wiring. The lamp holder and ballast 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. 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 and to change the 2 available utilization voltage taps on the ballast.

(k) Component Mounting.

1. Modular Construction. All electrical components must be securely mounted to a modular plate in such manner that individual components can be easily maintained or replaced. Permanent straps or tie-wraps will not be permitted. Provisions must be included to secure the component mounting plate in its "disconnected" position to allow easy access to terminal blocks and components for installation and maintenance. The entire assembly should be easily disconnected and removed for replacement.

2. Interchangeability. Component mounting plates must be mutually field interchangeable so that units can be restored to working condition without trouble shooting components.

3. 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.

(l) Slip-fitter. The slip-fitter must be suitable for attachment over the end of either a one and a quarter inch (1-1/4") or a two inch (2") steel pipe inserted against a built-in pipe stop, and provided with an approved means of clamping firmly in place. It must have an adequate clamping length and permit a secure grip on the pipe by means of a clamp arrangement, or a saddle type clamping sleeve, subject to approval, in order to assure a stable attachment which must withstand jarring, vibration, and wind and ice loads. The slip-fitter must be designed to permit adjustment of not less than three (3) degrees above and below the axis of the mounting bracket to compensate for slight misalignment. Unless otherwise specified in the proposal, the slip-fitter will be set for a 2-inch pipe mounting. The slip-fitter will contain an approved shield around the pipe entrance to block entry of birds.

- (m) Reflector. The optical system must be designed to perform properly and efficiently with a reflector. The reflector must be made of hydroformed aluminum sheet of a grade quality such that the reflecting surface must have a specular finish and the reflection factor of the reflecting surface, as determined by the A. H. Taylor or Baumgartner Reflectormeter, must not be less than 78%. The reflecting surface must have a dense protective coating of oxide not less than  $0.0116\text{mg/mm}^2$  (7.5 milligrams/in<sup>2</sup>), applied by the anodic oxidation process. The reflector must have a reverse flange to prevent direct light radiation on the gasket surface. The reflector must be held securely within the housing in a manner such that it can be readily removed and replaced. Reflector mounting must provide proper mating with the refractor. A silicone rubber, EPDM (ethylene propylene diene monomer), or EPR (ethylene propylene rubber) gasket must be fixed in place to seal between reflector and refractor. A breathing filter of Fiberglass or other approved material must be incorporated in the reflector for sealed optical units. It must effectively filter out dirt and particle size contaminants. The optical unit as a whole must provide an IES Medium Cut-off Type III distribution.
- (n) Refractor Holder-Door. The refractor holder-door must be a precision, aluminum ASTM Grade 356 permanent mold casting which must be hinged to the luminaire housing and must open downward approximately 90 degrees to allow servicing of the lamp. The hinging arrangement must be of rugged construction with corrosion resistant hinge fittings. The hinge must prevent the refractor-holder from disengaging and dropping in case it should swing open. The door must also be connected to the housing with a stainless steel cable. The refractor must be securely held in the holder-door, yet will be easily removed by means of a double action, quick release, corrosion resistant latch. When closed, the refractor holder-door must lock the refractor in precise optical alignment with the lamp, and with positive pressure against the sealing gasket. A sturdy, positive-acting, spring loaded latch will permit single-glove-handed release, and on closing of the refractor, holder-door must provide a definite snap action or visual indication that it is locked.

(o) Reflector Gasket. This gasket will be a silicone rubber, EPR (ethylene propylene rubber), or EPDM (ethylene propylene diene monomer) molded, cavity type gasket of an approved cross section.

(p) Hardware. All machine screws, locknuts, pins and set screws necessary to make a firm assembly, and for secure attachment of the luminaire to the mast arm, must be furnished in place. All hardware will be of stainless steel, copper silicon alloy, or other approved non-corrosive or suitably protected metal, and where necessary must be plated to prevent electrolytic action by contact with aluminum.

## **PHOTOMETRIC REQUIREMENTS**

9. (a) Parameters. The manufacturer must demonstrate that the luminaires will meet or exceed the specified photometric requirements under the following set of conditions. The manufacturer must provide photometric calculations using published luminaire data as part of the submitted package. The responsible material 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 in accordance with I.E.S. recommendations. 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. The program(s) used to perform the calculations must be identified in the submittal.

(b) Unless otherwise indicated, the light distribution will be I.E.S. classified as medium-cutoff-Type III (M-C-III), as defined in the American National Standard Practice for Roadway Lighting approved June 27, 2000 by the American National Standards Institute (ANSI).

(c) Verification of Data. All photometric data will be based on the parameters listed above. This data will be verified by an independent testing laboratory or manufacturer's laboratory as approved by the Commissioner. All testing must be performed on completed luminaires.

(d) Measurement Parameters.

1. Observer eye height: 4.75 feet above grade.
2. Line of sight of observer: Downward/one degree below horizontal; parallel to edge of roadway along lines 1/4 roadway lane width from edges of each lane (2 lines per lane).
3. Lighting system: Smooth and level, at least 10 mounting heights long.
4. Points per line: At least 10, not more than 16 feet apart.
5. Roadway area covered: All points between 2 luminaires on one side of roadway, centerline to curbline.
6. Parkway area covered: All points between 2 luminaires on one side of roadway, curbline to right of way.
7. Calculation point: At least one luminaire behind, and at least three ahead of calculation point.
8. Luminaire: Tilt will be 0 degrees.

(e) Given Conditions.

- |     |                    |                          |  |
|-----|--------------------|--------------------------|--|
| 1.  | Right of Way Width | 66 feet                  |  |
| 2.  | Pavement Width     | 50 feet                  |  |
| 3.  | Number of lanes    | 4                        |  |
| 4.  | IES Surface        | R3                       |  |
| 5.  | Mounting Height    | 30 feet                  |  |
| 6.  | Mast Arm Length    | 8 feet                   |  |
| 7.  | Pole set back      | 3 feet                   |  |
| 8.  | Lamp               | 310 watt clear HPS       |  |
| 9.  | Lamp position      | Horizontal or Vertical   |  |
| 10. | Lumens             | 37000                    |  |
| 11. | IES Distribution   | Medium-Cutoff - Type III |  |
| 12. | Light Loss Factor  | .7                       |  |
| 13. | Pole Spacing       | 110 feet                 |  |
| 14. | Configuration      | Two sides - Opposite     |  |
| 15. | Overhang           | 5 feet                   |  |

(f) Performance Requirements.

- |    |                          |                       |
|----|--------------------------|-----------------------|
| 1. | Roadway Illuminance:     |                       |
|    | Average Horizontal       | 2.5 fc                |
|    | Uniformity Ratio Av/Min  | 3:1                   |
|    | Uniformity Ratio Max/Min | 6:1                   |
| 2. | Roadway Luminance:       |                       |
|    | Average Luminance        | 1.6 cd/m <sup>2</sup> |
|    | Uniformity Ratio Av/Min  | 3:1                   |
|    | Uniformity Ratio Max/Min | 6:1                   |
|    | Max Veiling Luminance    | 0.3                   |



**TESTING**

9. (a) Witness Testing. At a maximum, luminaire testing will be conducted on two percent of the manufacturer=s production models for each order in which the quantity of luminaires is 50 or more. The number of tests and the type of tests will be as required by the Commissioner. The testing will include photometric and electrical testing, and additional testing. All testing must be certified by the manufacturer, or an independent lab.
- (b) The selection of luminaires must be a random selection from the entire completed lot of luminaires.
- (c) Photometric testing must be in accordance with IES recommendations except that the selected luminaires will be tested as manufactured without any disassembly or modification. The photometric tests must be conducted with a reference lamp and ballast. The reference lamp must be installed in a manner recommended by the lamp manufacturer and the optical assembly must not be specially prepared for the tests.
- (d) Electrical testing must conform to NEMA and ANSI standards and, as a minimum, must yield:
10. A complete check of wiring connections
  11. A ballast dielectric test
  12. Total ballast losses in watts and percent of input.
  13. A lamp volt-watt trace
  14. Regulation data
  15. A starter test
  16. Lamp current crest factor
  17. Power factor (minimum over the design range of input voltage at nominal lamp voltage)
  18. A table of ballast characteristics showing input amperes, watts and power factor, output volts, amperes, watts and lamp crest factor as well as ballast losses over the range of values required to produce the lamp volt-watt trace.
- (e) Interchangeability of all component parts.

(f) Thermal testing in accordance with U.L. Standard 1572 or Standard 1598. The fixture must be placed in a controlled 25° Centigrade 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.

(g) Vibration testing in accordance with ANSI Standard C136.31/1. Upon completion of the tests, all set screws, castings, and components will be carefully examined to determine whether there has been a compromise in the security of the luminaires, mounting and/or components.

(h) 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.

(i) The summary report and the test results must be certified by the independent test laboratory or the manufacturer=s laboratory, as applicable, and must be sent directly to the Commissioner before the luminaires are shipped. The Commissioner may require some or all of the tests mentioned.

(j) Should any of the tested luminaires of a given distribution type and wattage fail to satisfy the specifications and perform in accordance with approved submittal information, that luminaire will be rejected. The City may then require additional testing. Each luminaire may be subject to testing, if the City so deems.

**SHIPMENT AND DELIVERY**

10. (a) General. The luminaires must be carefully inspected at the factory prior to shipment to assure that they are complete and free of defects. When luminaires are stacked together, they must be supported with suitable spacers or must otherwise be protected from dents and other potential shipping damage. The spacing and protective materials must be suitable for and usable in the storage of the luminaires. All hardware must be packaged in a clear container and labeled.
- (b) Packaging. Each luminaire assembly must be securely packed in a suitable carton so that it will not be damaged by shipment and/or handling.
- (c) Marking. Each carton containing a luminaire must be clearly marked on the outside in letters not less than 3/8" tall with the legend: "CHICAGO 2000 TEARDROP LUMINAIRE W/BALLAST, HP-SODIUM, IES TYPE M-C-III". The wattage, appropriate City Commodity Code Number, name of manufacturer, date of manufacture, and contract number under which the luminaire is furnished must also be clearly marked on the carton.
- (d) Delivery. Luminaires will be delivered to the Division of Electrical Operations at 2451 South Ashland in Chicago, or to another City location as indicated on the order. Luminaire information submitted for approval will include any recommendations of the Manufacturer for storage as required under this Contract.

**ELECTRICAL SPECIFICATION 1505  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO**

**REVISED JULY 17, 2006**

**CHICAGO 2000 LIGHT POLE: ANCHOR BASE, 32'-6", 7 GAUGE FLUTED,  
TAPERED STEEL FOR 15" BOLT CIRCLE**

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**SUBJECT**

1. This specification states the requirements for an Anchor Base Chicago 2000 Light Pole. The pole must support single or twin, simplex mounted mast arm(s) and teardrop luminaire(s). A split pedestal base will be provided to cover the bottom nominal 40" of the pole. A finial will be mounted at the top of the pole. This pole will be served by underground cables.

**SUBMITTAL INFORMATION REQUIRED**

2. (a) Manufacturer's Certification of Compliance. The submittal information must include a written certification of compliance with this Specification from the Manufacturer.
- (b) Manufacturer's Shop Drawings. Scaled manufacturer's shop drawings showing actual light pole dimensions, details, and welds. Shop drawings must be original engineering drawings created by the manufacturer; photocopied or scanned copies of the Standard Drawings will not be accepted, and will be rejected as an incomplete submittal. These drawings must also be submitted in electronic format in Microstation 95, if requested; failure to provide drawings in this format will be cause for rejecting the submittal.

Dimensions must include but will not be limited to: mast height, width, taper, and fluting; base plate length, width, thickness, and bolt circle; handhole length, width, and height above base plate; component attachment plan locations and heights above baseplate including simplex brackets, finial top, banner arms, and flower basket rosettes; and all decorative bracelet heights above base plate.

Details must include scaled and dimensioned plan views, front elevations, side elevations, and section views as required for components including but not limited to: handhole; simplex brackets; finial top; banner arm attachments and finials; flower basket rosettes; and all decorative bracelets. All components must be clearly identified on the drawings.

Welds must include but will not be limited to: locations, sizes, and types of welds in accordance with the WELDING Section of this Specification.

- (c) Manufacturer's catalog cut sheets showing light pole designation(s), characteristics, and catalog number(s).
- (d) Manufacturer's specifications including fabricating materials and processes.
- (e) Manufacturer's written installation instructions and maintenance manuals including recommendations and/or procedures for storage, assembly, orientation, installation, component access and wiring, and numeric tolerances for torquing the foundation anchor bolts to the light pole base plate.
- (f) Sample. If requested by the Chief Procurement Officer, one completely assembled anchor-base pole with integral components, or one mast head and finial, or ornamental bracelets, of the manufacture intended to be furnished, must be submitted for review within fifteen (15) business days from receipt of notice.
- (g) Warranty. The manufacturer must warrant the performance and construction of these light poles to meet the requirements of this specification and must warrant all parts, components, and appurtenances against defects due to design, workmanship, or material developing within a period of three years after the light poles have been delivered. This will be interpreted particularly to mean structural or mechanical failure of any component, failure of any weld, or failure of any portion of the painting system. The warranty must be furnished in writing guaranteeing replacement, including shipment, free of charge to this Contract and to the City, of any light pole assembly, or any component parts thereof, which, as determined by the Commissioner, would develop aforesaid failures. The warranty must accompany submittal information. Any light pole or part thereof not performing as required or developing defects within this period, must be replaced by the manufacturer at no cost to the City. The Commissioner will be the sole judge in determining which replacements are to be made and the Commissioner's decision will be final. Any cost for the warranty as specified will be incidental to this contract.

**GENERAL**

3. (a) Products. Light pole masts and component equipment must be the products of a single, established manufacturer, and must be suitable for the service required. Light pole masts or component equipment items which are proposed as similar or identical must be the products of a single manufacturer. Masts will be manufactured by Union Metal Corporation, Valmont Industries Incorporated, or an approved equal.
- (b) Specifications. The pole 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. The pole must be manufactured in accordance with AASHTO's 1994 version of the "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals." The shaft and base plate assembly must be designed to meet AASHTO's 1994 criteria for 80 MPH wind loading with a 30% gust factor, for: twin gateway mast arms; twin gateway luminaires of not less than 65 pounds each and having an effective projected area (EPA) of not less than 1.70 square feet each; twin gateway luminaire fitters of not less than 50 pounds each and having an EPA of not less than 0.73 square feet each; twin banners 6 feet high by 1.5 feet wide each; and twin flower baskets weighing 75 pounds each and having an EPA of not less than 3.0 square feet each.
- (c) Drawings. The drawings mentioned herein are drawings of the Department of Transportation being an integral part of this specification cooperating to state the necessary requirements.
- (d) Design. The pole must conform in design and dimensions to corresponding Standard Drawings 930, 930C, and 724.
- (e) Approval. Whenever "approval" and "approved" are used in this specification they will mean a written approval by the Commissioner to be secured prior to proceeding with manufacture of these light poles.
- (f) Commissioner's Review. The Commissioner will be the sole judge in determining the submitted light pole compliance with this Specification. The Commissioner's decision will be final.

**MAST**

4. (a) Mast Size. The mast size must be nominally 32'-6" as shown on Standard Drawing 930. The mast diameter at the bottom must be 10".
- (b) Mast Design. The mast must be tapered at 0.14" per foot. The 32'-6" long mast must be of monotube construction and must be rolled on a mandrel to provide a 16-flute pattern. The flutes must be neat, true to pattern, and free from cracks and flaws. Each mast must be straight and centered on its' longitudinal axis. The mast must utilize a single longitudinal weld, 70% minimum penetration, in accordance with the WELDING Section of this Specification. There must be no lateral welds in the mast other than at the base plate and at the flower basket rosettes.
- (c) Material. The mast must be 7 gauge, high strength low alloy steel in accordance with ASTM A595, Grade A.
- (d) Mast Base. The mast base must be a 1¼" thick steel plate of low alloy, high strength steel conforming to ASTM A 595, Grade C, ASTM A 588 or ASTM A 606.
1. The base must be attached to the mast so that the bearing surface of the base is at right angles to the longitudinal axis of the mast. The vertical center line of the seam must be positioned 135 degrees counter-clockwise from the vertical center line of the mast arm support plates.
  2. The mast must be inserted into the base to a maximum depth which will still allow for an adequate weld to be made between the bottom of the mast and the plate. A circumferential weld must be made between the mast and the base at both the top and underside of the plate.
  3. The base plate must have four (4) 1 1/2" wide slots to accommodate 1 1/4" diameter anchor bolts. The slots must be a total of three inches long measured along the circumference. The mast must provide for mounting on a 15" bolt circle using 1 1/4" anchor bolts, nuts and washers provided by others. Any special hardware required to facilitate installation must be provided under this contract.
- (e) Provision for Ground. A 1/2" - 13 square nut must be welded to the inside of the mast on the handhole entry frame for a ground connection.

- (f) Entry. A vertical doorframe carrying a removable door providing access to the interior of the mast must be welded into a close fitting opening centered approximately 24" above the bottom of the base. The doorframe must be formed and welded of steel with cross section not less than 1-1/2" wide by 1/4" inch thick so as to adequately reinforce the opening of the mast. The internal horizontal clearance of the doorframe must be 4"; its internal vertical height must be 8". Its upper and lower ends must be semi-circular meeting its straight sides tangentially. The frame must have two welded tabs; one at the top and one at the bottom of the door frame. The top hole must be located 13/16 of an inch from the top of the opening. The bottom hole must be located 13/16 of an inch from the bottom of the opening. These tabs must be drilled to accept a 1/4 inch screw. Stainless steel spring clips must be mounted to the tabs. These clips must be made to accept 1/4"-20 machine screws. The entry must in all respects be identical to handhole openings on poles that have already been installed and accepted by the City.
- (g) Door. The removable door must be formed of sheet steel approximately 1/8" thick. It must fit the doorframe closely and be dished so that it will stay in proper position even if its locking screws become slightly loosened. The door must be drilled top and bottom to accept the 1/4" - 20 hex head stainless steel screws which will fasten the door to the doorframe. All doors must be interchangeable. Doors must fit pole handholes of like poles that have already been installed and accepted by the City. Alternate methods will be subject to approval by the Commissioner or his fully authorized representative.
- (h) Tag. A stainless steel tag must be attached to each pole immediately below the handhole by mechanical means and not by adhesive. The stainless steel tag must have an embossed legend which must include the pole outside diameter at the base, the overall length, and the gauge; i.e. 10" x 32'-6" - 7 gauge.
- (i) Interchangeability. Each member including the handhole doors in the pole and all component equipment must be mutually interchangeable for assembly, so that no work will be required to make any member fit properly in the place of any other similar member of any other similar pole.



- (j) Simplex Brackets. Two simplex mast arm support plates must be provided opposite each other as shown on the Drawings, and in accordance with Standard Drawing No. 659. The mast arm support plates must be made of cast steel conforming to the requirements for Grade 65-35 cast steel of ASTM A27, or equivalent, subject to approval. They must neatly fit the external surfaces of the fluted mast. Each mast arm support plate must have a hollow protuberance, the hole of which must be approximately equivalent to two (2) inches in diameter, extending into the interior of the pole providing a smooth surface for the lamp cables to rest upon. Each mast arm support plate must be designed so that it will carry the mast arm and hold it in the proper position for fastening the mast arm to the mast. The design of the mast arm support plates must be a two (2) bolt type as shown on Drawing No. 659. The brackets must be factory assembled to the mast. The finished mast must give the appearance of a single, homogeneous mast and the entire assembly must be structurally sound so that with the weight of the mast arm(s) and luminaire(s), the mast will not twist, rack, vibrate or otherwise deform when subjected to the severe vibrations of wind loading, passing elevated trains or heavily loaded vehicles.
- (k) Flower Basket Rosettes. The pole must be equipped with flower basket rosettes welded to the pole at the factory. Other flower basket attachments are not integral to the pole and are optional.
- (l) Luminaire Mounting Height. The luminaire mounting height indicates the height necessary to provide a distance of 30.0 feet from the top of the light pole foundation to the light source center of the luminaire.

#### **BANNER AND BASKET ATTACHMENTS (Optional)**

5. (a) Optional Attachments. Banner arm attachments and flower basket attachments must be provided as an option. These items must be provided only if ordered as a separate line item. All attachments must be manufactured to properly fit the pole shaft. All castings and parts must be permanently labeled on the back. The label must clearly identify the part and the pole it is to be used for.
- (b) Banner Arms. Banner arms, bracelets, couplings, and hardware necessary to attach banners must be provided. The appearance and dimensions of these items are shown on Standard Drawings 930, 930B, and 930C. Unless otherwise noted, the banner arms must be constructed of a light weight material flexible enough to withstand the loads presented by the appropriate size banners under ASSTHO wind loadings. The banner arms must have an approximate outside diameter of 1-3/4".
  - (c) Flower Basket Attachments. The bracelet and all necessary hardware for attaching a flower basket must be provided. The appearance and dimensions of these items are shown on the Standard Drawings.

**FINIAL TOP(Optional)**

6. (a) Design. The finial mast top must include different pieces assembled together to resemble a single, uniform casting. The pieces must include a top, two side pieces and a side finial ball as shown on Standard Drawings 930, 930B, and 930C. Two sets of end covers for the arms should be included to accommodate the possible use of two arms. The top must be essentially conical with a globe-shaped lower-end and have a minimum wall thickness throughout of not less than 5/32 inches. The cone portion must meet the skirted portion of the top in a smooth filet, and the skirt must enclose the top 7/8 inches of the mast. Three stainless steel, or other similar approved material, set screws not less than 5/16 inches long must be equally spaced in tapped holes around the skirt and must hold the top securely in place atop the mast. The design of the top must be as shown on the Standard Drawings. All castings and parts must be permanently labeled on the back of the part. The part label must clearly identify the part and the pole it is intended for. All mast heads and finials must have the appearance as shown on the Standard Drawings. The dimensions on the drawings are for attachment to the Chicago 2000 Gateway pole. Mast heads and finials for combination traffic poles, 11" or 12.5" poles, must be sized accordingly.
- (b) Material ( Aluminum Option) The top finial must be made of aluminum alloy 356-F per ASTM B108. The top must have smooth surfaces, neat edges and corners and be free of fins, holes or other casting flaws.
- (c) Material ( Fiberglass Option) The top finial must be fiberglass. The mast heads and finial must be manufactured by Shakespeare Company, W.J. Whatley, or an approved equal. Each piece 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. The color must be gloss black. The resin must contain color pigment throughout. A finish coat of urethane enamel must be applied to the surfaces to a minimum dry thickness of 1.5 mils. All pieces must be assembled using stainless steel screws. The fiberglass must have stainless inserts for the screws. Alternate non-metallic materials may be considered.
- (c) Finish. Tops must be painted as herein specified.

## **HARDWARE**

7. All the hardware necessary to complete the assembly of the pole must be furnished. All hardware must be stainless steel, or equal corrosion-resistant metal, subject to approval.

## **WELDING**

8. (a) General. Where welds are required and approved, each welded joint must be thoroughly cleaned of flux and spatter, and must be made in conformity with the standards of the American Welding Society. Each bidder must submit with his proposal a drawing showing the sizes and types of welds, in conformity with the proper interpretation of the standard welding symbols of the American Welding Society. The bidder's proposal must state the type of electrode and must describe the welding methods proposed for use in fabricating the pole.
- (b) Certifications. Welders must have proper certification for the welding operations required. Welding by non-certified personnel will not be allowed. Certifications for welding personnel must be included with the submittal information package for review.
- (c) Testing. All welds of 5% of the poles in every lot must be inspected for penetration and soundness of the welds by the magnetic particle inspection method or by radiography. Acceptance or rejection will be governed by the same conditions as in the TESTING Section. If the magnetic inspection process is used, the dry method with direct current must be employed. All transverse welds must be magnetized by the "prod" (Circular Magnetization) method. Longitudinal welds may be magnetized by either circular or longitudinal magnetization. Proposed weld inspection method must be included with the submittal information package for review.

## **PAINTING**

9. (a) Oil and Grease Removal. All metal surfaces must be washed with an alkaline detergent to remove oils and grease.
- (b) Metal Cleaning. All exterior metal surfaces must be cleaned by blasting with a combination of shot and grit to remove all dirt, mill scale, rust, corrosion, oxides and foreign matter and provide a "near white" surface in accordance with 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°F to form a high molecular weight fusion bonded finish.
- (e) Alternate Methods. Alternate powder coat methods may be reviewed and tested on a case by case basis. However, no coating method will be accepted unless the Commissioner judges such alternate to be equal to the coating herein specified.
- (f) Interior Coat. The interior metal surfaces must be powder coated with a thermoplastic hydrocarbon resin containing corrosion inhibitors. The resin must be formulated for full application over untreated metal surfaces. The resin must be applied at a temperature of approximately 200°F to a minimum thickness of 3 mils. The interior thermoplastic coat must overlap the interior, thermosetting base coat by approximately 6". Alternate interior coatings may be used subject to prior approval of the Commissioner.
- (g) Durability. Both the exterior and interior coats must be capable of passing 1,000 hours of salt spray exposure per ASTM B117 in a 5% Na Cl (by weight) solution at 95°F and 95% relative humidity without blistering. Before test, the panel must be scribed with an "X" down to bare metal.
- (h) Coating Measurement. Measurement of coating thickness must be done in accordance with SSPC-Pa 2-73T, "Measurement of Dry Paint Thickness with Magnetic Gauges," except that the lowest "single spot measurement" in an area of two square inches must be not less than 7.0 mils.
- (i) Color. Color must be gloss black unless noted otherwise in the order. A 4" square color chip sample must be submitted for approval prior to fabrication. The chip sample must be of the same material as the pole mast, and must include the manufacturer's name and the manufacturer's color name as well. The sample must also include any other information required to purchase the same color for the mast arm(s), flower baskets, and the cast aluminum finial and split pedestal base.

## **STRUCTURAL REQUIREMENTS**

10. (a) Calculations: The manufacturer must provide certified pole deflection calculations showing compliance with 1994 AASHTO wind loading requirements for 80 mph winds with 30% gusts. The calculations must be performed based on a completely assembled mid-block historic gateway lighting unit including shaft, mast arm(s), finial, luminaire(s), fitter(s), banners, and flower baskets, as specified herein. The structural calculations must be signed and sealed by a registered structural engineer.
- (b) Parameters. The manufacturer must demonstrate that the light poles will meet or exceed the specified structural requirements under the following set of conditions. The manufacturer must provide structural calculations using published loading data as part of the submittal package, and must perform structural testing using actual completed light pole masts from the specific order as part of the testing. The responsible material proposal must contain verification of structural performance with results equal to or better than those listed in these Specifications. Submittal information must include computer calculations based on the controlling given conditions which demonstrate achievement of all listed performance requirements. Computer calculations must be done in accordance with both 1994 AASHTO recommendations and the City of Chicago requirements. The program(s) used to perform the calculations must be identified in the submittal. The structural testing must include maximum deflection and set as well as listings of all indicated test loads.
- (c) Verification of Data. All structural data must be based on the parameters listed above. This data must be verified by an independent testing laboratory or manufacturer's laboratory as approved by the Commissioner. All testing must be performed on completed light pole masts. Where this data causes the structural integrity to fall below the values required by this specification, additional masts must be tested in a manner acceptable to the Commissioner.

## **TESTING**

11. (a) Testing. Structural testing must be conducted on five percent of the manufacturer's production masts for each order in which the quantity of masts is 20 or more. The testing must include coupon tests, load tests, and weld tests. All testing must be certified by the manufacturer, or an independent lab.

1. (b) The selection of pole masts must be a random selection from the entire completed lot of pole masts required for the Contract. Selections from partial lots will not be allowed.
- (c) Coupon tests as outlined in ASTM A53 and A 595, A588, or A606.
- (d) Load tests for masts. With base rigidly anchored, a test load of 1500 pounds must be applied at a point approximately two feet (2' - 0") from the free end. The load must be applied at right angles to the center line of the mast and in the same vertical plane. The deflection must not be greater than 30". Within one (1) minute after the test load is released, measurement must be made of the set taken by the mast. This set must not be greater than 2.5". The deflection measurement device must be reset to zero and the test load must be reapplied. The deflection must not change from the deflection noted in the first test by more than  $\pm 5\%$ . No measurable set must be noted within one (1) minute after test load is released. The mast must then be checked to insure that it is still securely fastened, that it is plumb, and that no cracks have developed in either the mast or base plate.
- (e) Load tests for masts arm supports. With gateway mast arms rigidly anchored, a test load of 300 pounds must be applied to each mast arm at a point approximately seven feet (7' - 0") from the pole mast. The load must be applied at right angles to the center line of the mast arm and in the same vertical plane. Each mast arm support must then be checked to insure that it is still securely fastened and that no cracks have developed in either mast arm support bracket or the weld.
- (f) Load tests for flower basket rosettes. With base rigidly anchored, a test load of 150 pounds must be applied to each rosette ring. The load must be applied at right angles to the center line of the mast and in the same vertical plane. Each rosette must then be checked to insure that it is still securely fastened and that no cracks have developed in either the ring, rosette, or rosette weld.
- (g) Weld tests as described in the WELDING Section of this Specification.
- (h) Acceptance of Alternate or Corrected Equipment. Tests must be made on 5% of all masts in the order. If any of the masts fail to meet these specifications, an additional three masts must be tested for each failed mast. Should any of these additional masts fail to meet these specifications, the entire lot will be subject to rejection. The Commissioner will then decide, based on the nature of the failure, whether the entire lot will be rejected outright or whether the manufacturer may subject each mast in the order to testing. If each mast in the order is tested, those masts which fulfill the specified requirements may be accepted at the discretion of the Commissioner.

**SHIPMENT AND DELIVERY**

12. (a) General. The poles must be carefully inspected at the factory prior to shipment to assure that the poles are complete and free of defects. When poles are stacked together, they must be supported with suitable spacers or must otherwise be protected from dents and other potential shipping damage. The spacing and protective materials must be suitable for and usable in the storage of the poles. All pole hardware must be packaged in a clear container and labeled. Castings and parts must be packaged in clearly labeled boxes. Parts hardware must be packaged in clear containers, properly labeled.
- (b) Pole Packaging. The poles must be shipped in bundles weighing a maximum of 5,000 pounds. Each pole must be individually wrapped and protected so that it can be bundled and unbundled without damage to the pole or its finish. Each pole wrapping must be labeled using permanent ink in two inch letters identifying the pole type, height, and gauge. Specific instructions must be securely attached to each bundle indicating the proper methods of storage. In addition, each bundle must contain specific instructions on unbundling and erection of poles. Instructions must be printed on a fibre based paper with a permanent ink so that instructions will be completely legible after weathering outdoors for a minimum of 5 years.
- (c) Pole Bundles. The bundles must consist of poles laid base to top to form an approximately rectangular cylinder. Materials such as lumber (2" x 4" min.) non-marring banding, and other appropriate bundling materials must be used to make a rigid, long lasting bundle capable of being handled, shipped and stored without shifting of contents or breaking. Bundling procedure will be subject to approval. Any bundles, in which either poles or packaging is received broken, damaged or with contents shifted, will not be accepted and it will be the responsibility of the supplier to return the bundle to its original destination at no cost to the City of Chicago. The bundles should be capable of being stacked two high without breaking, or shifting of the contents. Each bundle must be capable of being lifted by a fork lift truck or crane and the bundles must be shipped on a flat bed truck to facilitate unloading.
- (d) Pole Hardware. Any appurtenant devices and hardware not attached to the pole must be carefully wrapped and securely attached to each bundle. Payment will be withheld for any units provided without the appropriate appurtenant devices and hardware. Cracked, broken, chipped or damaged units will also be considered as incomplete quantities as regards payment.

- (e) Castings and Parts. Castings and parts, such as the finial, banner brackets, etcetera, must be individually wrapped and packaged in boxes. Hardware must be packaged in a clear package, clearly labeled. The label must identify each piece of hardware and the quantity of each, as well as what part the hardware is intended for. An individual box must contain like part types and the related hardware( i.e. the upper banner bracelet halves and hardware must be boxed separately from the lower banner bracelet halves and hardware). Each box must be labeled with 3/8" letters identifying the manufacturer, the casting or part numbers, the part name, the date of manufacture, the City contract number, and the City Commodity code.
  
- (f) Delivery. Light poles must be delivered to the Division of Electrical Operations storage yard at 4101 South Cicero in Chicago, or as indicated on the order. Light pole information submitted for approval must include any recommendations of the Manufacturer for storage.



**ELECTRICAL SPECIFICATION 1513  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO**

**REVISED JULY 17, 2006**

**SPLIT PEDESTAL BASE: FOR CHICAGO 2000 LIGHT POLE**

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**SUBJECT**

1. This specification states the requirements for a split pedestal base (Clamshell) for installation on a 10" x 32'-6" fluted, tapered steel Chicago 2000 light pole. This specification will address the requirements for a split aluminum base with aluminum doors, a split fiberglass base without doors, and non-metallic doors only.

**SUBMITTAL INFORMATION REQUIRED**

2. (a) Manufacturer's Certification of Compliance. The submittal information must include a written certification of compliance with this Specification from the Manufacturer.

- (b) Manufacturer's Shop Drawings. Scaled manufacturer's shop drawings showing actual split pedestal base and/or door dimensions, details, and welds. Shop drawings must be original engineering drawings created by the manufacturer; photocopied or scanned copies of the Standard Drawings will not be accepted, and will be rejected as an incomplete submittal. These drawings will also be submitted in electronic format in Microstation 95, if requested by the City; failure to provide drawings in this format will be cause for rejecting the submittal.

Dimensions must include but will not be limited to: base height, width, pattern, and fluting; access door opening length, width, plan location, and height above base bottom.

Details must include scaled and dimensioned plan views, front elevations, side elevations, and section views as required for components including but not limited to: base, access doors and door attachments.

Welds must include but will not be limited to: locations, sizes, and types of welds in accordance with the WELDING Section of this Specification.

- (c) Manufacturer's catalog cut sheets showing split pedestal base and/or door designation(s), characteristics, and catalog number(s).

- (d) Manufacturer's specifications including fabricating materials and processes.
- (e) Manufacturer's written installation instructions and maintenance manuals including recommendations and/or procedures for storage, assembly, orientation, installation, and numeric tolerances for torquing the access door bolts to the split pedestal base.
- (f) Sample. If requested by the Chief Procurement Officer, one completely assembled split pedestal base and/or doors with hardware and all components, of the manufacture intended to be furnished, will be submitted for review within fifteen (15) business days from the receipt of notice. The sample base must be coordinated with an existing Chicago 2000 light pole for accuracy of fit. The sample door must be coordinated with an existing base for accuracy of fit.
- (g) Warranty. The manufacturer must warrant the performance and construction of these split pedestal bases and/or doors 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 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 shipment, free of charge to this Contract and to the City, of any split pedestal base or door assembly, or any component parts thereof, which, as determined by the Commissioner, would develop aforesaid failures. The warranty must accompany submittal information. Any split pedestal base, door, or part thereof not performing as required or developing defects within this period, must be replaced by the manufacturer at no cost to the City. The Commissioner will be the sole judge in determining which replacements are to be made and the Commissioner's decision will be final. Any cost for the warranty as specified will be incidental to this contract.

### **GENERAL**

- 3. (a) Products. Split pedestal bases and/or doors and component equipment must be the products of established manufacturers, and must be suitable for the service required. Split pedestal bases or component equipment items which are proposed as similar or identical must be the products of a single manufacturer. Aluminum Bases and/or doors 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.

- (b) Specifications. The split pedestal bases and/or doors must conform in detail to the requirements herein stated, and to the Specifications and Methods of Test of the American Society for Testing and Materials cited by ASTM Designation Number, of which the most recently published revision will govern.
- (c) Drawings. The drawings mentioned herein are drawings of the Department of Transportation being an integral part of this specification cooperating to state the necessary requirements.
- (d) Design. The base and/or doors must conform in design and dimensions to corresponding Standard Drawings 930 and 930A.
- (e) Approval. Whenever “approval” and “approved” are used in this specification they will mean a written approval by the Commissioner to be secured prior to proceeding with manufacture of these split pedestal bases and/or doors.
- (f) Commissioner’s Review. The Commissioner will be the sole judge in determining the submitted split pedestal bases and/or doors compliance with this Specification. The Commissioner’s decision will be final.

**OPTION 1. ALUMINUM BASE WITH DOORS**

- 4. (a) Each split pedestal base must be cast aluminum conforming to ASTM B26/B26M, Grade 356. Each base must be certified as pure #356 alloy, free of foreign materials or cosmetic fillers.
- (b) The split pedestal base must conform in detail and dimensions to Standard Drawings 930 and 930A.
- (c) All castings must be done in a workmanlike manner which will result in uniform casting without warping or mold shifting. 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 halves of the split base casting 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 split pedestal base to the mast, a minimum of 3/8" 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 will be 3/8"-16 steel allen head screws and a minimum of four set screws must be provided, two per base half. The set screws must be black.
- (f) The split pedestal base must provide two entry doors, opposite each other, whose appearance and fit are in consonance with the mast and base design both aesthetically and structurally. The doors must be of the same material as the base.
1. The doors must be securely fastened in place with four 1/4"-20 hex head stainless steel screws which will thread into a rigid door frame. The door frame must be drilled and tapped. The door must be drilled only.
  2. All doors must be interchangeable with any other base, including bases of like design which have already been installed and accepted by the City. Bases whose doors are matched to a single base will be rejected.
  3. The doors must be positioned in the base such that the base can be attached to the mast with the base doors in perfect alignment with the mast handhole door.
  4. The doors must provide ample room for a worker to reach into the base with hand tools, open the mast handhole door, splice wires, change connectors and read the identification tag on the mast.
- (g) Interchangeability. Each member including the access doors in the base and all component equipment must be mutually interchangeable for assembly, so that no work will be required to make any member fit properly in the place of any other similar member of any other similar base.
- (h) Fabrication. It is preferred that the split pedestal base is cast as a single unit and sawcut into identical halves.
- (i) Standards. Each split pedestal base must be made in conformity with the proper interpretation of the applicable ASTM Standards, and as indicated on the drawings.

- (j) Certification. All split pedestal bases must be made by personnel who are certified for that type of work. Work must be performed in accordance with NIST Certification.
- (k) Finishing. Finishing work must be performed at the manufacturer's facility. All work must be inspected for shop finish, soundness and appearance by the Commissioner.

**OPTION 2. FIBERGLASS BASE WITHOUT DOORS**

- 5. (a) Each pedestal base must be formed of a fiberglass composite consisting of a polyester resin and containing a minimum of 65% fiberglass by weight. The resin must contain no clay fibers. The composite must be UV and weather resistant. Alternate materials may be considered. Each base half must be permanently marked on the inside identifying it as a base for a pedestrian pole.
- (b) The split pedestal base must conform in detail and dimensions to Standard Drawings 930 and 930A.
- (c) The two halves of the clamshell must be identical to each other. They must be perfectly matched and when installed there 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 degrees. The set screws will be 5/16"-18 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 Chicago 2000 poles. The resin must contain color pigment throughout. The pigment must be even throughout the thickness of the base. A finish coat of urethane enamel must be applied to the surface of the base to a minimum dry thickness of 1.5 mils. The resin color must match the enamel color. A paint sample on fiberglass must be submitted for approval prior to production. The paint manufacturer's name and any information necessary to acquire the same color for the pole must be provided. The contractor must supply one quart of touch-up paint for every 50 bases ordered.
- (f) The texture of the fiberglass base exterior 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 as shown on Standard Drawing 930A. The screws must fit so that the halves

of the base are drawn together so that the edges of the base fit snug against each other. Threaded stainless steel inserts in the base must be used to affix the screws. The screws must 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**

6. (a) Each base door must be formed of fiberglass (as described in Section 5.) 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 Chicago 2000 light pole base.
- (b) The door must conform to the detail and dimensions of Standard drawings 930 and 930A. All doors must be interchangeable in both existing and proposed Chicago 2000 light poles bases.
- (c) The color of the door must be gloss black and must match the color of existing and proposed Chicago 2000 light 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 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 stainless steel screws which will thread into the base frame. The door will be properly drilled to accept the screws. The holes must not be tapped. The screws must have a stainless steel core within a threaded nylon body. Screws must be supplied with the doors.

**OPTION 4. ALUMINUM BASE WITH NON-METALLIC DOORS**

7. Each aluminum base must meet the requirements of Option 1, with the exception of the doors. Each door must be non-metallic meeting the requirements of Option 3.

**WELDING FOR ALUMINUM BASES**

8.
  - (a) General. Where welds are required and approved, each welded joint must be thoroughly cleaned of flux and spatter, and must be made in conformity with the standards of the American Welding Society. Each bidder must submit with his proposal a drawing showing the sizes and types of welds, in conformity with the proper interpretation of the standard welding symbols of the American Welding Society. The bidder's proposal must state the type of electrode and must describe the welding methods proposed for use in fabricating the base.
  - (b) Certifications. Welders must have proper certification for the welding operations required. Welding by non-certified personnel will not be allowed. Certifications for welding personnel must be included with the submittal information package for review.
  - (c) Testing. All welds of 5% of the bases in every lot must be inspected for penetration and soundness of the welds by the magnetic particle inspection method or by radiography. Acceptance or rejection must be governed by the same conditions as in the testing section. If the magnetic inspection process is used, the dry method with direct current must be employed. All transverse welds must be magnetized by the "prod" (Circular Magnetization) method. Proposed weld inspection method must be included with the submittal information package for review.

**PAINTING OF ALUMINUM BASES**

9.
  - (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 400oF 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 must be capable of passing 1,000 hours of salt spray exposure as per ASTM B117 in a 5% Na Cl (by weight) solution at 95°F and 95% relative humidity without blistering. Before 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 unless noted otherwise in the order. A 4" square color chip sample must be submitted for approval prior to fabrication. The chip sample must be of the same material as the split pedestal base, and must include the manufacturer's name and the manufacturer's color name as well. The sample must also include any other information required to purchase the same color for the pole, mast arm(s), and the cast aluminum finial.
- (h) Field Touch-up. Any minor damage to the split pedestal base surfaces must be touched-up in a professional manner as recommended by the paint manufacturer, with protective coating solutions as provided by the split pedestal base manufacturer at no additional cost to the City. Any major damage to the split pedestal base or components surfaces must be repaired at the manufacturer's place of business, or must be replaced as directed by the Commissioner. The Commissioner will be the sole judge of the extent of any such damage and the adequacy of repair. The Contractor must supply a field touch-up kit for every 20 bases or fraction thereof. Each kit must consist of a highly legible instruction sheet, one gallon of the recommended touch-up paint and all other materials required to touch-up 20 bases.



**FABRICATION REQUIREMENTS FOR ALUMINUM BASES**

10. (a) Foundry Qualifications. The manufacturer must demonstrate that the foundry proposed to fabricate the split pedestal bases must meet or exceed the specified qualification requirements under the following set of conditions. The manufacturer must provide foundry qualifications using published capacity data as part of the submittal package, and must include the actual molding and core equipment proposed for use in fabricating the split pedestal bases for the specific order. The responsible material proposal must contain verification of production capacity including the number of shifts per day running in the plant. Submittal information must include the foundry's written Quality Assurance Plan which demonstrates achievement of the latest industry technology in testing requirements. Submittal information must demonstrate that the work performed by the foundry will be done in accordance with both ASTM Standards and NIST Certification. Further, the foundry must be a domestic facility, unless proven to be directly owned and operated by the manufacturer.
- (b) Verification of Data. All foundry qualifications must be based on the parameters listed above. This data must be verified by an independent witness or representative as approved by the Commissioner. All verification must be performed on site at the foundry. The cost of verification must be included in this item. Should the foundry be deemed incapable of meeting this Specification after verification, the Contractor must provide an alternate foundry as approved by and at no additional costs to the Commissioner. The foundry qualifications and verification process must be repeated in it's entirety.

**TESTING**

11. (a) Testing. Testing must be conducted on five percent of the manufacturer's production bases or doors for each order in which the quantity is 20 or more. All testing must be certified by the manufacturer, or by an independent lab.
- (b) The selection of bases or doors must be a random selection from the entire completed lot ordered.
- (c) Requirements for Aluminum Bases. All completed aluminum bases must 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 the WELDING Section of this Specification.
- (d) Requirements for Fiberglass Bases and Non-Metallic Doors. All completed fiberglass bases and non-metallic doors must 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.
  - (e) The summary report and the test results must be certified by the independent test laboratory or the manufacturer's laboratory, as applicable, and must be sent directly to the Commissioner before the bases and/or doors are shipped.
  - (f) Acceptance of Equipment. Tests must be made on 5% of all bases or doors in the order. If any of the bases or doors fail to meet these specifications, an additional three bases or doors must be tested for each failed unit. Should any of these additional units fail to meet these specifications, the entire lot will be subject to rejection. The Commissioner will then decide, based on the nature of the failure, whether the entire lot will be rejected outright or whether the manufacturer may subject each base or door in the order to testing. If each base or door in the order is tested, those units which fulfill the specified requirements may be accepted at the discretion of the Commissioner.

### **SHIPMENT AND DELIVERY**

12. (a) General. The split pedestal bases and/or doors must be carefully inspected at the factory prior to shipment to assure that the bases and/or doors are complete and free of defects. When bases or doors are stacked together, they must be supported with suitable spacers or must otherwise be protected from dents and other potential shipping damage. The spacing and protective materials must be suitable for and usable in the storage of the bases and doors. All hardware must be packaged in a clear container and labeled as to size, quantity, and part association.

- (b) Packaging. The split pedestal bases must be shipped on pallets with at least six units per pallet. Each base must be individually wrapped and protected so that it can be bundled and unbundled without damage to the base or its finish. Each base wrapping must be labeled to identify the base. Specific instructions must be securely attached to each pallet indicating the proper methods of storage. In addition, each pallet must contain specific instructions on the installation of the split pedestal bases. Instructions must be printed on a fibre based paper with a permanent ink so that instructions will be completely legible after weathering outdoors for a minimum of 5 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 CHICAGO 2000 POLE BASE), the part number, the manufacturer, the date of manufacture, and the contract number.
- (c) Appurtenant Devices and Hardware. Any appurtenant devices and hardware not attached to the bases must be carefully wrapped, labeled, 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 units provided without the appropriate appurtenant devices and hardware, or for any missing or improper packaging or labeling. Cracked, broken, chipped or damaged units will also be considered as incomplete quantities as regards payment.
- (d) Touch-up Paint. Touch-up paint and appurtenant materials must be packaged in units sufficient for the number of bases on each pallet. These units will be securely attached to each pallet.
- (e) Delivery. Split pedestal bases and/or doors will be delivered to the Division of Electrical Operations storage yard at 4101 South Cicero in Chicago, or as indicated on the order. Split pedestal base information submitted for approval will include any recommendations of the Manufacturer for storage.

**ELECTRICAL SPECIFICATION 1514  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO**

**REVISED JULY 23, 2001**

**CHICAGO 2000 MAST ARM: 8-FOOT, STEEL**

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**SUBJECT**

1. This specification covers the requirements for an 8-foot straight steel mast arm and decorative scroll for supporting a teardrop street light luminaire on a Chicago 2000 light pole or other pole fitted for a simplex attachment.

**SUBMITTAL INFORMATION REQUIRED**

2. (a) Manufacturer's Certification of Compliance. The submittal information must include a written certification of compliance with this specification from the Manufacturer
- (b) Manufacturer's Shop Drawings. Scaled manufacturer's shop drawings showing actual mast arm and scroll dimensions, details, and welds. Shop drawings must be original engineering drawings created by the manufacturer; photocopied or scanned copies of the Standard Drawings will not be accepted, and will be rejected as an incomplete submittal. These drawings must also be submitted in electronic format in Microstation 95, if requested by the City; failure to provide drawings in this format will be cause for rejecting the submittal.

Dimensions must include but will not be limited to: mast arm length, diameter, and ornamentation; attachment plate length, width, thickness, and bolt circle; scroll length, cross section dimensions, and shape.

Details must include scaled and dimensioned plan views, front elevations, side elevations, and section views as required for components including but not limited to: attachment plates; ornamentation; and arm attachments.

Welds must include but will not be limited to: locations, sizes, and types of welds in accordance with the WELDING Section of this specification.

- (c) Manufacturer's catalog cut sheets showing mast arm and scroll designation(s), characteristics, and catalog number(s).
- (d) Manufacturer's specifications including fabricating materials and processes.
- (e) Manufacturer's written installation instructions and maintenance manuals including recommendations and/or procedures for storage, assembly, orientation, installation, component access and wiring, and numeric tolerances for torquing the attachment plate bolts to the light pole mast arm support plate.
- (f) Sample. If requested by the Chief Procurement Officer, one completely assembled gateway mast arm with scroll and integral components, of the manufacture intended to be furnished, must be submitted for review within fifteen (15) business days from receipt of notice.
- (g) Warranty. The manufacturer must warrant the performance and construction of these mast arms and scrolls to meet the requirements of this specification and must warrant all parts, components, and appurtenances against defects due to design, workmanship, or material developing within a period of three years after the mast arms and scrolls have been delivered. This will be interpreted particularly to mean structural or mechanical failure of any component, failure of any weld, or failure of any portion of the painting system. The warranty must be furnished in writing guaranteeing replacement, including shipment, free of charge to this Contract and to the City, of any mast arm assembly, or any component parts thereof, which, as determined by the Commissioner, would develop aforesaid failures. The warranty must accompany submittal information. Any mast arm or part thereof not performing as required or developing defects within this period, must be replaced by the manufacturer at no cost to the City. The Commissioner will be the sole judge in determining which replacements are to be made and the Commissioner's decision will be final. Any cost for the warranty as specified will be incidental to this contract.

**GENERAL**

3. (a) Products. Mast arms and component equipment must be the products of established manufacturers, and must be suitable for the service required. Mast arm or component equipment items which are proposed as similar or identical must be the products of a single manufacturer. Mast arms must be manufactured by Union Metal Corporation, Valmont Industries Incorporated, or an approved equal.
- (b) Specifications. The mast arm and scroll 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. The arm must be manufactured in accordance with AASHTO's 1994 "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals." The mast arm and attachment plate assembly must be designed to meet AASHTO's 1994 criteria for 80 MPH wind loading with a 30% gust factor, for gateway luminaires of not less than 65 pounds each and having an effective projected area (EPA) of not less than 1.70 square feet each; and twin gateway luminaire fitters of not less than 50 pounds each and having an EPA of not less than 3.5 square feet each.
- (c) Drawings. The drawings mentioned herein are drawings of the Department of Transportation being an integral part of this specification cooperating to state the necessary requirements.
- (d) Design. The mast arm and scroll must conform in design and dimensions to Standard Drawings 930 and 930C.
- (e) Approval. Whenever "approval" and "approved" are used in this specification they will mean a written approval by the Commissioner to be secured prior to proceeding with manufacture of these mast arms and scrolls.
- (f) Commissioner's Review. The Commissioner will be the sole judge in determining the submitted mast arms compliance with this specification. The Commissioner's decision will be final.

**ARM DESIGN**

4. (a) 8-Foot Mast Arm. Each 8-foot mast arm must be fabricated from a continuous, single piece, two (2) inch "extra strong" steel pipe conforming to the requirements of ASTM A53, Table X2. It must conform in detail with the mast arm shown on Standard Drawings 930 and 930C.
- (b) Mast Arm Attachment. The mast arm attachment to be welded to all mast arms must conform to Standard Drawing 724. It must be a steel forging per ASTM A668, Class D, or cast steel conforming to the requirements for Grade 65-35 cast steel of ASTM A27, or it can be fabricated from 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. Provision must be made for fastening the attachment to each mast arm support by two special screws and washers as noted in the HARDWARE Section of this Specification.
- (c) Entryway for Wires. A drilled opening lined with a neoprene grommet having inserted therein a neoprene plug must be provided on the underside of the upper member of all arms approximately three inches from the point of attachment. The clear opening must not be less than 5/8 inch in diameter. Its design must be submitted for approval by the Commissioner or his authorized representative.
- (d) Mast Arm Members. All mast arm members must conform with the type of steel required for the arm specified. The members must be continuous lengths of pipe and bar cut to the proper size to fabricate the mast arm lengths requested. No butt welded, swaged and welded or other pieced together configurations of pipe and bar lengths will be accepted. The outer and inner surfaces of the pipes and bars must be smooth and even without protrusions, nicks, holes or other imperfections.
- (e) Interchangeability. Each member including the arm and all component equipment must be mutually interchangeable for assembly, so that no work will be required to make any member fit properly in the place of any other similar member of any other similar mast arm.

## **SCROLL DESIGN**

5. (a) Scroll. The scroll must be fabricated out of 3/4 inch thick by 2-1/2 inch wide bar stock meeting the requirements of ASTM A36. The scroll must be formed as shown on Standard Drawing 930.
- (b) Clamps. The scroll must be attached to the mast arm and pole by clamps, as shown on Standard Drawing 930. The clamps must meet the requirements of ASTM A307 galvanized to ASTM A153. All connecting hardware must meet the Hardware requirements of the HARDWARE Section of this Specification.
- (c) Identification. The scroll and clamps must be permanently labeled for identification purposes. The identification must not affect the aesthetics of the scroll.
- (d) Painting. The scroll and clamps must be painted per the requirements of the PAINTING Section in this Specification.
- (e) Welding. The scroll must be welded per the requirements of the WELDING Section in this Specification.

## **WELDING**

6. (a) General. Where welds are required and approved, each welded joint must be thoroughly cleaned of flux and spatter, and must be made in conformity with the standards of the American Welding Society. Each bidder must submit with his proposal a drawing showing the sizes and types of welds, in conformity with the proper interpretation of the standard welding symbols of the American Welding Society. The bidder's proposal must state the type of electrode and must describe the welding methods proposed for use in fabricating the mast arm.
- (b) Certifications. Welders must have proper certification for the welding operations required. Welding by non-certified personnel will not be allowed. Certifications for welding personnel must be included with the submittal information package for review.



- (c) Testing. All welds of 5% of the mast arms and scrolls in every lot must be inspected for penetration and soundness of the welds by the magnetic particle inspection method or by radiography. Acceptance or rejection will be governed by the same conditions as in the TESTING Section. If the magnetic inspection process is used, the dry method with direct current must be employed. All transverse welds must be magnetized by the "prod" (Circular Magnetization) method. Proposed weld inspection method must be included with the submittal information package for review.

## **HARDWARE**

7. Two (2) special 1/2" - 13 NC x 1-1/2" long stainless steel cap screws, and two (2) stainless steel flat washers, must be provided for each mast arm attachment. All other hardware necessary to complete the assembly of the mast arm and scroll must be furnished. All hardware must be stainless steel, or equal corrosion-resistant metal, subject to approval.

## **PAINTING**

8. (a) Oil and Grease Removal. All metal surfaces must be washed with an alkaline detergent to remove any oils or grease.
- (b) Metal Cleaning. All exterior metal surfaces must be cleaned by blasting with a combination of shot and grit to remove all dirt, mill scale, rust, corrosion, oxides and foreign matter and provide a "near white" surface in accordance with SSPCS-SP10.
- (c) Chemical Pretreatment. The cleaned metal surfaces must be treated with a hot, pressurized iron phosphate wash and must be dried by convection heat.
- (d) Exterior Coat. A Thermosetting, polyester powder coat must be applied electrostatically to all cleaned and treated surfaces to a uniform eight (8) mil thickness in a one coat application. This powder coat must be cured in a convection oven at a minimum temperature of 400°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 noted otherwise in the order. A 4" square color chip sample must be submitted for approval prior to fabrication. The chip sample must be of the same material as the mast arm, and must include the manufacturer's name and the manufacturer's color name as well. The sample must also include any other information required to purchase the same color for the pole mast and the cast aluminum finial and split pedestal base.

- (j) Field Touch-up. Any minor damage to the mast arm surfaces must be touched-up in a professional manner as recommended by the paint manufacturer, with protective coating solutions as provided by the mast arm manufacturer at no additional cost to the City. Any major damage to the mast arm shaft or component surfaces must be repaired at the manufacturer's place of business, or must be replaced as directed by the Commissioner. The Commissioner will be the sole judge of the extent of any such damage and the adequacy of repair. The Contractor must supply a field touch-up kit for every 20 mast arms or fraction thereof. Each kit must consist of a highly legible instruction sheet, one gallon of the recommended touch-up paint and all other materials required to touch-up 20 mast arms and scrolls.

## **STRUCTURAL REQUIREMENTS**

9. (a) Calculations: The manufacturer must provide certified deflection calculations showing compliance with 1994 AASHTO wind loading requirements for 100 mph winds with 30% gusts. The calculations must be performed based on a completely assembled gateway mast arm and luminaire, as specified herein. The scroll must not be considered as a structural element for the calculations. The structural calculations must be signed and sealed by a registered structural engineer.
- (b) Parameters. The manufacturer must demonstrate that the mast arms will meet or exceed the specified structural requirements under the following set of conditions. The manufacturer must provide structural calculations using published loading data as part of the submittal package, and must perform structural testing using actual completed mast arms from the specific order as part of the testing. The responsible material proposal must contain verification of structural performance with results equal to or better than those listed in these Specifications. Submittal information must include computer calculations based on the controlling given conditions which demonstrate achievement of all listed performance requirements. Computer calculations must be done in accordance with both 1994 AASHTO recommendations and the City of Chicago requirements. The program(s) used to perform the calculations must be identified in the submittal. The structural testing must include maximum deflection and set as well as listings of all indicated test loads.
- (c) Verification of Data. All structural data must be based on the parameters listed above. This data must be verified by an independent testing laboratory or manufacturer's laboratory as approved by the Commissioner. All testing must be performed on completed mast arms. Where this data causes the structural integrity to fall below the values required by this Specification, the masts must be redesigned in a manner acceptable to the Commissioner and retested until all requirements of this Specification are met. Should the mast arms be incapable of meeting this Specification after modification, the Contractor must provide suitable replacement mast arms as approved by and at no additional costs to the Commissioner.

**TESTING**

10. (a) Testing. Structural testing must be conducted on five percent of the manufacturer's production mast arms and scrolls for each order in which the quantity is 20 or more. The testing must include coupon tests, load tests, and weld tests. All testing must be certified by the manufacturer, or an independent lab.
- (c) The selection of mast arms and scrolls must be a random selection from the entire completed lot required in the order.
- (d) Coupon tests for the arm and the scroll as outlined in ASTM A53, A 668, A27, or A36.
- (e) Load tests for mast arms. The scroll must not be considered as part of the load test. With mast arm rigidly anchored, a test load of 300 pounds must be applied at a point approximately one foot (1' - 0") from the free end. The load must be applied at right angles to the center line of the mast arm and in the same vertical plane. The deflection must not be greater than 3". Within one (1) minute after the test load is released, measurement must be made of the set taken by the mast arm. This set must not be greater than 0.5". The deflection measurement device must be reset to zero and the test load must be reapplied. The deflection must not change from the deflection noted in the first test by more than  $\pm 5\%$ . No measurable set must be noted within one (1) minute after test load is released. The mast arm must then be checked to insure that it is still securely fastened, that it is plumb, and that no cracks have developed in either the mast arm or attachment plate.
- (f) Weld tests for both the arm and the scroll as described in the WELDING Section of this Specification.
- (f) Acceptance of Equipment. Tests must be made on 5% of all mast arms and scrolls in the order. If any of the mast arms or scrolls fail to meet these specifications, an additional three mast arms or scrolls must be tested for each failed unit. Should any of these additional units fail to meet these specifications, the entire lot will be subject to rejection. The Commissioner will then decide, based on the nature of the failure, whether the entire lot will be rejected outright or whether the manufacturer may subject each mast arm or scroll in the order to testing. If each mast arm or scroll in the order is tested, those mast arms or scrolls which fulfill the specified requirements may be accepted at the discretion of the Commissioner.

**SHIPMENT AND DELIVERY**

11. (a) General. The mast arms and scrolls must be carefully inspected at the factory prior to shipment to assure that the mast arms and scrolls are complete and free of defects. When mast arms are stacked together, they must be supported with suitable spacers or must otherwise be protected from dents and other potential shipping damage. The spacing and protective materials must be suitable for and usable in the storage of the mast arms. The same requirements apply to the scrolls. All hardware must be packaged in a clear container and labeled.
- (b) Packaging. The mast arms and scrolls must be shipped in bundles weighing a maximum of 1,000 pounds. Mast arms and scrolls must be in separate bundles. Each mast arm or scroll must be individually wrapped and protected so that it can be bundled and unbundled without damage to the unit or its finish. The wrapping must be clearly marked to identify the arms and scrolls. Specific instructions must be securely attached to each bundle indicating the proper methods of storage. In addition, each bundle must contain specific instructions on unbundling and erection of the mast arms or scrolls. Instructions must be printed on a fiber based paper with a permanent ink so that instructions will be completely legible after weathering outdoors for a minimum of 5 years.
- (c) Bundles. The bundles must consist of arms or scrolls laid to form an approximately rectangular cylinder. Arms and scrolls must be packaged in separate bundles. Materials such as lumber (2" x 4" min.) non-marring banding, and other appropriate bundling materials must be used to make a rigid, long lasting bundle capable of being handled, shipped and stored without shifting of contents or breaking. Bundling procedure will be subject to approval. Any bundles, in which either mast arms, scrolls or packaging is received broken, damaged or with contents shifted, will not be accepted and it will be the responsibility of the supplier to return the bundle to its original destination at no cost to the City of Chicago. The bundles should be capable of being stacked two high without breaking, or shifting of the contents. Each bundle must be capable of being lifted by a fork lift truck or crane and the bundles must be shipped on a flat bed truck to facilitate unloading.

- (d) Appurtenant Devices and Hardware. Any appurtenant devices and hardware not attached to the mast arm or scroll must be carefully wrapped and securely attached to each bundle. All device and hardware containers must be clearly labeled as to the contents. Labels must identify the quantity of parts and their relationship to the arms or scrolls. Payment will be withheld for any units provided without the appropriate appurtenant devices and hardware. Cracked, broken, chipped or damaged units will be considered as incomplete quantities as regards payment. Improperly labeled units will also be considered as incomplete.
  
- (e) Touch-up Paint. Touch-up paint and appurtenant materials must be packaged in units sufficient for twenty 20 mast arms and 20 scrolls. These units will be securely attached to a sufficient number of bundles to fulfill the touch-up paint requirements stated herein.
  
- (f) Delivery. Mast arms and scrolls must be delivered to the Division of Electrical Operations storage yard at 4101 South Cicero in Chicago, or to a location indicated on the order. Mast arm and scroll information submitted for approval must include any recommendations of the Manufacturer for storage as required under this Contract.

**ELECTRICAL SPECIFICATION 1517  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
REVISED AUGUST 18, 2006**

**PEDESTRIAN PUSH BUTTON**

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**SUBJECT**

1. This specification states the requirements for a pedestrian push button assembly which will include the switch and housing. This will be used to generate a signal to a traffic controller which will, in turn, actuate a walk signal.

**GENERAL**

2. (a) Specifications. The push button assembly must conform in detail to the requirements herein stated, and to the latest requirements of the Manual on Uniform Traffic Control Devices (MUTCD). The push button assembly must also meet the most recent requirements of the Americans with Disabilities Act (ADA).
- (b) Acceptance. Push button assemblies not conforming to this specification will not be accepted.
- (c) Drawings. The drawing mentioned herein is a drawing of the Department of Transportation. It is an integral part of this specification.
- (d) Bidders Drawings. Bidders must submit with their bids detailed scale drawings of the push button proposed to be used. The drawings must show every dimension necessary to indicate how parts will fit each other and be properly held in assembly.
- (e) Sample. One complete push button assembly 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 assembly against defects due to design, workmanship, and material, for a period of one year from the date of acceptance by the City. If any assembly fails to properly function within this period, the manufacturer will replace the assembly, free of charge to the city, including shipping. Failure will include, but not be limited to, loss of button function and paint failure.



### **DETAIL REQUIREMENTS**

3. (a) Assembly. Each pedestrian push button assembly must consist of a one piece aluminum casting incorporating a heavy duty push button switch, sign plaque with cast, raised, printed legend and integral banding brackets.
- (b) Design and Size. Each unit must appear as that shown on Standard Drawing 834. Each unit must be a permanent mold casting fabricated of aluminum alloy 356-TS6. The casting must be approximately 13 1/4" long with the extreme upper and lower segments molded to accept 3/4" banding. It must also be possible to bolt the assembly to a mounting surface using two holes that are in the center of the integral banding brackets. Directly below the upper integral banding bracket must be an integral sign plaque approximately 5" wide by 8" long. Cast into this plaque must be a raised printed legend taking up the full space of the plaque. This legend must read "PUSH BUTTON - WAIT FOR WALK SIGNAL" in letters at least one inch high. Directly below the plaque must be a cast switch housing. The housing must be of sufficient depth to accommodate the push button switch. In the center of the push button housing must be a threaded hole. The hole must be tapped for 5/8-11 UNC course thread. The push button switch must be screwed in from the rear of the housing. Directly below the push button housing must be the lower integral banding bracket. The rear of the casting must be open to facilitate wiring, inspection, and access to the switch. The extreme upper and lower segments in the rear must be curved to fit a round 10" to 12.5" pole at the appropriate height. The push button itself must be approximately two inches in diameter. The force to activate the switch must be no greater than 3.5 pounds. The entire push button assembly must operate between -35° Fahrenheit to +165° Fahrenheit. The push button unit must be equivalent to Alinco Model PBA-1000-2B.
- (c) Push Button Switch. The contacts must be normally open and must be closed when the push-button is pressed, restoring immediately to a normal open position when released. The switch must be rated at 35 amps at 12 volts d.c. or 20 amps at 24 volts d.c.. The switch contacts must be composed of 90% silver and 10% cadmium oxide to minimize arcing and pitting on the contact surfaces. The body of the switch must be of brass or other non-rusting material and must be approximately one inch in diameter. The upper body of the switch around the actuator must have a 5/8" threaded collar to allow mounting to the housing. The contacts must be entirely enclosed and insulated from the push-button housing.

- (d) Finish. The exterior finish of the housing must be powder coated with gloss black enamel. The background of the sign plaque must be painted a white enamel with black letters per MUTCD standards.

**PACKAGING**

- 4. (a) General. The push button housing and switch must be shipped fully assembled and ready for installation. Each assembly must be individually wrapped and boxed so that the assembly is not damaged in shipment.
- (b) Labeling. Each box must be labeled in 3/8 inch high letters A PEDESTRIAN PUSH BUTTON@. The City Commodity Code, contract number, manufacturer, and date of manufacture must be clearly labeled on the box.

**ELECTRICAL SPECIFICATION 1524  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
REVISED JULY 31, 2006**

**LAMPS: HIGH PRESSURE SODIUM FOR STREET LIGHTING**

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**SUBJECT**

1. This specification states the requirements for high pressure sodium lamps for street lighting service. Lamps must burn in various positions: base up, base down, and horizontal.

**PHYSICAL REQUIREMENTS**

2. The lamps must conform to the physical characteristics of ANSI Standard C78.42-1995 "High-Pressure Sodium Lamps". All bases must be of the screw-shell-type made of brass and meeting ANSI Standard C81.61. Bases will be mogul or medium depending upon the requirements. Bulb material must be lead borosilicate glass. The bulb finish must be clear. The arc tube material must be polycrystalline aluminum oxide.

**ELECTRICAL REQUIREMENTS**

3. The lamp must conform to the electrical characteristics of ANSI Standard C78.42-1995.

**LIGHT OUTPUT**

4. The color temperature of the lamp must be between 1050 and 2100 degrees Kelvin. At half the average rated lamp life, the mean output lumens must not be less than 90% of the initial lumen output.

**TESTING**

5. All lamps must be tested according to the requirements in ANSI Standard C78.42-1995. Because street light lamps operate under harsher conditions than most lamps, the physical structure of these lamps will be required to withstand the vibrations due to weather and traffic conditions expected in the Chicago area.

**INDIVIDUAL LAMP CHARACTERISTICS**

6. High pressure sodium lamps must meet the following:

Wattage	Rated Life (hours)	Initial Lumens	Lamp Voltage
35	16000	2250	52
50	24000	4000	52
70	24000	5800	52
100	24000	9500	55
150	24000	15000	100
200	24000	22000	100
250	24000	27500	100
310	24000	37000	100
400	24000	50000	100
750	16000	110000	120
1000	24000	140000	250

**WARRANTY**

7. The manufacturer will be required to replace, with new rated life lamps, without cost to the City, all lamps failing to operate satisfactorily for the specified period as indicated in the following paragraphs.

Any lamp that fails during the first 500 hours of operation must be replaced with a new, operable, lamp without charge to the City.

After the first 500 hours of operation, based on published lamp mortality tables, any lamp failures in excess of the published figures will require replacement lamps in numbers equal to the excess failures. This will apply for the first three years of the lamp life. All replacements will be at no cost to the City. Replacement lamps must be new.

**PACKAGING**

8. All lamps must have the date of manufacture, either actual or coded, embossed on the lamp base or another suitable location.

All lamps must be individually packaged and packed in properly labeled cartons so as to prevent damage in shipping or storage.

**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.

**ELECTRICAL SPECIFICATION 1533  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
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.

**ELECTRICAL SPECIFICATION 1534  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
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 indicated 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 City, 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) Flame Tests. Included in the 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.
- (d) Test Reports. No cable may be shipped until certified copies of all factory tests 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.
- (c) Reels. The completed cable must be delivered on sound substantial, non-returnable reels. Both ends of each length of cable must be properly sealed against the entrance of moisture and other foreign matter by the use of clamp-on cable caps, such as the Reliable Electric Company neoprene cable cap No. 1405, or equal. The ends must be securely fastened so as not to become loose in transit. Before shipment, all reels must be wrapped with cardboard or other approved wrapping.
- (d) Footage. Each reel must contain the length of cable as set forth in Table A of this specification. Alternate lengths may be considered.
- (e) Reel Marking. A metal tag must be securely attached to each reel indicating the reel number, contract number, date of shipment, gross and tare weights, description of the cable, the total footage, and the beginning and ending sequential footage numbers. Directions for unrolling the cable must be placed on the reel with an approved permanent marking material such as oil-based paint or a securely attached metal tag.

**TABLE "A"**

CONDUCTOR		INSULATION/JACKET THICKNESS		A-C TEST	REEL
<u>AWG</u>	<u>LENGTH STRANDS</u>	<u>MILS</u>	<u>MILS</u>	<u>VOLTS</u>	<u>FEET</u>
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

**ELECTRICAL SPECIFICATION 1537  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
SEPTEMBER 26,2006**

**CABLE: TRAFFIC SIGNAL, MULTIPLE CONDUCTOR, COPPER WIRE, 600 VOLT**

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**SUBJECT**

1. This specification states the requirements for a multiple cable to be installed in underground conduits and used to distribute electrical energy to operate automatic traffic control equipment at street intersections within the City of Chicago. The cable will be used between the traffic controller cabinet and the junction boxes on the traffic signal poles.

**GENERAL**

2. (a) Specification. The cable must conform in detail to the requirements herein stated, and to the specifications and methods of test of the following:  
  
ASTM - American Society for Testing and Materials  
ICEA - Insulated Cable Engineers Association  
IEEE - Institute of Electrical and Electronic Engineers  
UL - Underwriters Laboratories
- (b) Acceptance. Cable not conforming to this specification will not be accepted.
- (c) Sample. If requested by the Chief Procurement Officer, a three (3) foot sample of the cable intended to be furnished under this specification must be submitted to the attention of the Engineer of Electricity within fifteen (15) business days of receipt of such request.
- (d) Warranty. The manufacturer must warrant the cable to be first class material throughout. In addition to any other claims against them, if the cable is installed within six months of date of shipment, the manufacturer must replace any cable failing during normal and proper use within two years of date of installation. All replacements under this warranty must be made free of charge F.O.B. delivery point of the original contract.

**CABLES**



3. (a) Construction. The cable must meet the requirements of ICEA standard S-95-658 and UL 44 for cable. The cable must consist of coated conductors each concentrically encased with a “free- stripping”, ethylene propylene, insulation. In two-conductor cables, the insulated and covered conductors must be parallel and not twisted, with suitable filler, as necessary, to produce a flat core of minimum practicable dimensions. In the larger count cables suitable fillers must be used to produce an essentially round cross-section. A Mylar tape must be wrapped over the conductor assembly, and a low smoke zero halogen polyolefin (LSZH) or chlorosulfonated polyethylene (CSPE) jacket applied overall.

(b) Outer Diameter. The maximum allowable outer diameter for round cables must be as follows:

<u>No. Of Conductors</u>	<u>Outer Diameter</u> (inches)
<b>Seven</b>	<b>0.49</b>
<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.

**COLOR CODE**

4. Conductor identification must be provided by color synthetic-resin coverings, or an approved equal. Table A sets forth the color code for the various conductor arrangements.

**CONDUCTOR**

5. (a) Material. Round, soft or annealed, copper wire, meeting the requirements of ASTM B-3 and B-8, and coated in accordance with ASTM B33.

(b) Size. Cables must be made up of conductor sizes as set forth in this specification. The Number 14 AWG will be solid. Number 4 AWG conductors will be stranded.

**INSULATION**

6. (a) Type. The insulation must be an ethylene propylene compound meeting the physical and electrical requirements herein specified when tested in accordance with ASTM D-470-81.
- (b) Thickness. The insulation must be circular in cross-section and have the following minimum thicknesses.

<u>Conductor Size. AWG</u>	<u>stranding (No. Of Wires)</u>	<u>No. of Conductors</u>	<u>Insulation Thickness (mils)</u>
#4	7	2	45
#14	1	7	30
#14	1	10	30
#14	1	19	30

- (c) Physical Properties. Initial Value.

Tensile Strength minimum	1200 psi
Elongation at Rupture	250% minimum

- (d) Physical Properties. After Aging.

After 168 hours in air oven at 121° Centigrade:

Tensile Strength value	75% of initial value
Elongation value	75% of initial value

- (e) Accelerated Water Absorption Characteristics. Test must be made in accordance with methods discussed ASTM D470.

Gravimetric Method. The insulation must not absorb more than five (5) milligrams of water per square inch of exposed surface area after immersion in distilled water at 70° Centigrade for a period of seven (7) days.

- (f) Cold-Bend Test Requirements. The completed cable must pass the "Cold" B end, Long-Time Voltage Test on Short Specimens" of ASTM D470 except that the test temperature must be minus (-) 25° Centigrade.

(g) Electrical Requirements.

- (1) Voltage Test. The completed cable must meet an A.C. and D.C. voltage test in accordance with ASTM D470 and D2655.
- (2) Insulation Resistance. The completed cable must have an insulation resistance constant of not less than 20,000 when tested in accordance with methods shown in ASTM D470.

**CABLE TAPE**

- 7. The assembled and cabled conductor core must be wrapped with a one mil (0.001 inch) thick Mylar tape allowing a minimum of ten percent (10%) overlap.

**JACKET**

- 8. (a) Material. The jacket must be either a heavy duty low smoke zero halogen (LSZH) polyolefin or low lead chlorosulfonated polyethylene (CSPE) meeting the physical and electrical requirements specified herein. CSPE must meet the requirements of CFR Title 40, Part 261 for leachable lead.
- (b) Workmanship. The jacket must have a smooth exterior surface free from holes, cracks and splits, and must be tough, elastic, homogeneous in composition, and properly vulcanized.
- (c) Thickness. Average thicknesses of the jacket must be not less than that given below. Minimum thickness must be not less than ninety percent (90%) of the average thickness.
 

(1) Two-Conductor # 4 AWG	5/64 inch
(2) Seven-Conductor	3/64 inch
(3) Ten-Conductor	4/64 inch
(4) Nineteen-Conductor	4/64 inch
- (d) Initial Physical Requirements:

1. Tensile strength minimum PSI	1800
2. Elongation at rupture, minimum percent	300
- (e) Air Oven Exposure Test. After conditioning in an air oven at  $121^{\circ} \pm 1^{\circ}\text{C}$  for 168 hours:
 

1. Tensile strength minimum percent of unaged value	75
2. Elongation at rupture, minimum percent of unaged value	65

- (f) Mechanical Water Absorption. After 168 hours at  $70^{\circ} \pm 1^{\circ}\text{C}$ : one (1) milligram per square inch, maximum
- (g) Cable Marking. Outer Jacket must be embossed or printed with the manufacturer's name, year of manufacture, insulation and jacket materials, conductor number, conductor size, at approximately 18" intervals. On the side opposite, the cable must be sequentially marked in one (1) foot increments.

### **TESTING**

- 9. (a) General. Tests must be performed on insulation, jacket and completed cables in accordance with applicable standards as listed in these specifications. Where standards are at variance with each other or with other portions of this specification, the most stringent requirements, as determined by an engineer from the City, will apply.
- (b) Number of Tests. Insulation and jacket tests must be conducted on samples taken every 25,000 feet or fraction thereof of each conductor size. In no case must samples be taken closer than 15,000 feet apart.
- (c) Flame Tests. 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.
- (d) Test Reports. No cable may be shipped until certified copies of all factory tests, including witness tests where applicable, have been reviewed and approved by the engineer.
- (e) Acceptance. Samples must be taken from each reel and must successfully conform to all tests specified herein. Reels from which samples fail to conform, will be rejected.

### **PACKAGING**

- 10. (a) Reels. The completed cable must be delivered on sound substantial, nonreturnable reels. Both ends of each length of cable must be properly sealed against the entrance of moisture and other foreign matter by the use of clamp-on cable caps, such as the Reliable Electric Company neoprene cable cap No. 1405, or equal. The ends must be securely fastened so as not to become loose in transit. Before shipment, complete 2 x 4 lagging must be applied to all reels.

- (b) Footage. Each reel must contain the length of cable as set forth below. A tolerance limit of plus or minus five percent ( $\pm 5\%$ ) must be adhered to.

(1) Two-Conductor	2000 feet
(2) Seven-Conductor	2000 feet
(3) Ten-Conductor	2000 feet
(4) Nineteen-Conductor	1000 feet

- (c) Marking. A metal tag must be securely attached to each reel indicating the reel number, contract number, date of shipment, gross and tare weights, the appropriate City commodity Code Number as set forth below, and a description of the cable. Also, each reel must have permanent marking on it indicating directions for unrolling the cable and the footage of cable contained in the reel. Indelible ink or other such material susceptible to washing off or fading will not be permitted; and approved permanent marking material such as paint or a securely attached metal tag is required.

- (d) Commodity Code Number.

(1) Two-conductor No. 4 AWG	31-4686-5826
(2) Seven-Conductor	31-4682-5620
(3) Ten-Conductor	31-4682-5630
(4) Nineteen-Conductor	31-4682-5645

**TABLE A COLOR CODE CONDUCTOR IDENTIFICATION**

Base Color	First Tracer	Second Tracer	2 (# 4)	7	10	19
White	Black	Red	--	--	--	14
White	Red	Green	--	--	--	14
Black	--	--	4	14	14	14
White	--	--	4	14	14	14
Red	--	--	--	14	14	14
Green	--	--	--	14	14	14
Orange	--	--	--	14	14	14
Blue	--	--	--	14	14	14
White	Black	--	--	14	--	--
Red	Black	--	--	--	14	14
Green	Black	--	--	--	14	14
Orange	Black	--	--	--	14	14
Blue	Black	--	--	--	14	--
Black	White	--	--	--	--	--
Red	White	--	--	--	--	14
Green	White	--	--	--	--	14
Blue	White	--	--	--	--	14
Orange	White	--	--	--	--	14
White	Red	--	--	--	--	--
Blue	Orange	--	--	--	--	14
Red	Blue	--	--	--	--	14
Green	Blue	--	--	--	--	14
Orange	Blue	--	--	--	--	14

**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).

<u>TEST</u>	<u>REQUIRED</u>	<u>METHOD</u>
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
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) 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 for the visor attachment.

- (f) Gaskets. Wherever necessary to make a completely dust-proof, moisture-proof and weatherproof assembly of the housing and optical system, approved type gaskets of neoprene or silicone rubber shall be provided.

#### **LED OPTICAL 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 "0" 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 "0" 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 1546  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO**

**FEBRUARY 1, 2006**

**ORNAMENTAL BRACKET ARMS FOR MID-MOUNT RESIDENTIAL AND ARTERIAL  
LUMINAIRES**

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**SUBJECT**

1. This specification states the requirements for a street lighting bracket arm for a mid-mount residential luminaire, and a street light bracket arm for a mid-mount arterial luminaire. The bracket for the mid-mount residential luminaire will be mounted to a light pole approximately ten feet above grade. The bracket for the mid-mount arterial luminaire will be mounted to a light pole approximately 16 feet above grade.

**GENERAL**

2. (a) Information Required. Each bidder must submit with his proposal the following information relative to the brackets he proposes to furnish:
1. Outline drawing (electronic format).
  2. Complete description and weight
  3. Manufacturer's name and catalogue designation of the bracket.
- (b) Sample. One complete bracket with hardware, of the manufacture intended to be furnished, must be submitted upon request of the Chief Procurement Officer within fifteen (15) business days from the receipt of notice.
- (c) Assembly. Each bracket must be delivered completely assembled, wired, and ready for installation. Each bracket must come complete with all necessary mounting hardware. Two one conductor #12 pole wire meeting City specifications will be installed in each bracket by the supplier. This cable will be 18 feet in length for the residential bracket and 25 feet in length for the arterial bracket.

(d) Warranty. The manufacturer must warrant the performance and construction of the brackets 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 bracket has been placed in service. Any bracket, or part thereof, not performing as required, or developing defects within this period must be replaced by the manufacturer without expense to the City.

### **BRACKET**

3. (a) Material. Each arm must be constructed of cast aluminum conforming to ASTM B26/B26M, Grade 319. A steel pipe must be inserted into the arm to provide added strength. The steel must conform to ASTM A595, Grade A. The pole plate must be constructed of high strength galvanized carbon steel. The tenon must be a minimum of 3/16" in thickness.

(b) Appearance. The residential bracket arm must conform in appearance and dimensions to that shown on Electrical Standard Drawing Number 959. The arterial bracket arm must conform in appearance and dimensions to that shown on Electrical Standard Drawing Number 959A.

(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. All wire ways must be smooth and free from any sharp edges. The pipe end at the tenon must have a plastic grommet, or otherwise made free of any sharp edges, to protect the wire.

(d) Structure. The contoured back plate for the residential bracket must be fastened to the street light pole with two(2), 3/8-16 X 1-1/4 inch stainless steel bolts with two(2) split lock washers (bolts and washers will be provided with this item). The backplate for the arterial bracket must allow for the option of band mounting by two 5/8 inch steel bands( banding will not be provided under this specification). The bracket arm must be expected to withstand normal vibrations, wind, and inclement weather and not fail or become loose.

### **PAINTING**

5. (a) Surface Preparation. Exterior surfaces of the bracket arm must be prepared by "Solvent Cleaning" per SSPC-SP1 using a solvent recommended for aluminum surfaces such as "Sherwin Williams MEK #R6K10." Solvent must be used as per written instructions of manufacturer to remove all oil, grease, dirt and contaminants.

- (b) Primer Type. Within one hour of surface preparation, surfaces must be primed using a primer specifically recommended for aluminum surfaces such as "Sherwin Williams Industrial Wash Primer #P60GZ."
- (c) Primer Application. Primer must be applied in accordance with written instructions of manufacturer to produce a minimum dry thickness film of 3.0 mils. Primer must dry for a minimum of 30 minutes and a maximum of 60 minutes before application of finish coat.
- (d) Finish Coat. Finish coat must be a polyurethane enamel specifically recommended for use over a primed aluminum surface. Two(2) coats of finish must be applied. Each coat must be a minimum of 1.5 mils dry thickness.
- (e) Color will be gloss black or silver as specified on the order.
- (f) Alternate painting methods will be considered where the contractor can demonstrate to the satisfaction of the Commissioner that these methods have been in successful use for a five (5) year minimum period.

## **PACKAGING**

- 10. (a) Packing. Each bracket with wire installed must be securely packed in a suitable carton so that it will not be damaged by shipment and/or handling. Back plates and bolts will be packed separately within the same carton.
- (b) Marking. Each carton must be clearly marked on the outside in letters not less than three-eighths (3/8) inch tall with the legend: "ORNAMENTAL MID-MOUNT RESIDENTIAL BRACKET" or "ORNAMENTAL MID-MOUNT ARTERIAL BRACKET", the appropriate City Commodity Code Number, the name of the manufacturer, the date of manufacture, and the contract number under which the brackets are being furnished.



**ELECTRICAL SPECIFICATION 1548  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
FEBRUARY 6, 2006**

**TEARDROP LUMINAIRE, HORIZONTAL LAMP, FOR CHICAGO 2000 POLE; 250  
WATT PULSE-START METAL HALIDE LAMP; I.E.S. TYPE III DISTRIBUTION**

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**SUBJECT**

1. This specification states the requirements for a type III teardrop style street lighting luminaire with high frequency electronic ballast, and a 250 watt pulse-start metal halide lamp. The luminaire must include fitter and must be fabricated for attachment to a 2" O.D. and 8' long steel mast arm on a Chicago 2000 light pole.

**SUBMITTAL INFORMATION REQUIRED**

2. (a) Information Required. Each bidder must submit a proposal, including information relative to the proposed luminaire as listed below and as further detailed in this Section, for review and approval. Failure to submit any of the information as listed and described below will constitute an incomplete submittal. Incomplete submittals will not be reviewed and will be considered rejected:
  4. Manufacturer certification of compliance.
  5. Manufacturer shop drawings and product data.
  6. Photometric calculations and data.
  7. Certified test reports and statements.
  8. Paint specification and sample.
- (b) Manufacturer's Certification of Compliance. The submittal information must include a written certification of compliance with this Specification, from the Manufacturer
- (c) Manufacturer's Shop Drawings and Product Data. Submittal will be complete, coordinated, approvable, and will demonstrate compliance with all Contract requirements specified herein. Submittal must include the luminaire and the fitter, and must incorporate the following:

9. Scaled manufacturer's shop drawings showing actual luminaire dimensions, description, weight, and EPA. Shop drawings must be original drawings created by the manufacturer. These drawings will also be submitted in electronic format in Microstation 95, if requested; failure to provide drawings in this format will be cause for rejecting the submittal.
10. Manufacturer's catalog cut sheets showing luminaire designation(s), characteristics, and catalog number(s). Also, manufacturer's catalog cut sheets for all electrical components including lamp, electronic ballast, lamp holder, terminal blocks, fuse holders and fuses, and wiring.
11. Manufacturer's specifications including fabricating materials and processes.
12. Manufacturer's written warranty for luminaire and all components.
13. Manufacturer's written verification of ISO 9001 Certification for entire facility.
14. Manufacturer's written installation instructions and maintenance manuals including recommendations and/or procedures for storage, assembly, orientation, relamping, component replacement, and wiring, and numeric tolerances for torquing the bolts to the arm and the refractor.

(d) Photometric Calculations and Data. Submittal must include the following:

15. Photometric calculations in accordance with the PHOTOMETRIC REQUIREMENTS Section of this Specification.
16. Descriptive literature of luminaire test date, and test report.
17. Candlepower distribution curve showing the light distribution in the 70 degree cone and in a vertical plane through the maximum beam.
18. Isofootcandle chart of horizontal foot candles.
19. Utilization efficiency charts and luminaire efficiency tables.
20. Luminaire classification per ANSI designation.
21. Candlepower values at every 5.0 degree intervals.
22. Candlepower tables in I.E.S. format in electronic format.
23. Luminaire manufacturer and catalog number in photometric test report.
24. Lamp description, ANSI designation, and manufacturer in photometric test report.

(e) Certified Test Reports and Statements. Submittal must include the following:

25. Thermal Test Report and Procedures in accordance with U.L. Standard 1572 or 1598 and in accordance with the TESTING Section of this Specification.
  2. Vibration Test Report and Procedures in accordance with ANSI Standard C136. 31/1 and in accordance with the TESTING Section of the Specification.
  26. Moisture Test Report and Procedures in accordance with U.L. Standard 1572 or 1598 and in accordance with the TESTING Section of this Specification.
  27. Statement of intent to provide all testing in accordance with the TESTING Section of this Specification, including description and request for approval of the proposed testing laboratory.
- (f) Paint Specification and Sample. Submittal must include detailed specifications and procedures for the manufacturer's powder coat paint process, and color sample in accordance with the CAST HOUSING AND FITTER PAINTING Section of this Specification.
- (g) Sample. If requested by the Chief Procurement Officer, one completely assembled luminaire with fitter and integral components, of the manufacture intended to be furnished, must be submitted for review within fifteen (15) business days from the receipt of notice.

## **GENERAL**

28. (a) Acceptance. All luminaires and component equipment must be new. Luminaires that are not new or that do not conform to this specification will not be accepted.
- (b) Products. Luminaires will be the product of a single, established manufacturer. Each electrical component will be the product of a single, established manufacturer and must be suitable for the service required. Electrical components proposed must meet the applicable requirements of this Specification.
- (c) Labels. On the inside of the capital, in an easily readable location, must be a label that includes the serial number and date of manufacture of the luminaire.
- (d) Assembly. Each luminaire must be delivered completely assembled, wired, and ready for installation; without the lamp. It must consist of the cast housing, refractor, and fitter as shown on Electrical Standard Drawing 931; reflector, lamp holder assembly, terminal block, ballast components, gaskets, fuses, and all necessary hardware.

- (e) Warranty. The manufacturer must 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 three years after delivery. This will be interpreted particularly to mean compatible performance of ballast with lamps of various manufacture, failure of any ballast component, loss of reflectivity of any reflecting surface, discolorations or fogging of any portion of the optical system impairing the transmission of light, and any failure in the paint surface. The reflector, the refractor or lens, and the entire optical assembly must not develop any discoloration over the normal life span of the luminaire. An extended warranty of seven years, over and above the normal warranty, must be furnished by the manufacturer pertaining to the above said discoloration. The extended warranty must be furnished in writing guaranteeing replacement, including shipment, free of charge to the City, of any optical assembly, or any component parts thereof, which, as determined by the Commissioner, would develop aforesaid discoloration. The extended warranty must accompany submittal information. Any luminaire or part thereof not performing as required or developing defects within this period, must be replaced by the manufacturer at no cost to the City. The Commissioner will be the sole judge in determining which replacements are to be made and the Commissioner's decision will be final. Any cost for the warranty as specified will be incidental to this contract.
- (f) Approval. Whenever "approval" and "approved" are used in this specification they will mean a written approval by the Commissioner to be secured prior to proceeding with manufacture of these luminaires.
- (g) Commissioner's Review. The Commissioner will be the sole judge in determining the submitted luminaires compliance with this Specification. The Commissioner's decision will be final.

#### **CAST HOUSING AND FITTER**

4. (a) Material. Each housing and fitter must be cast aluminum, ASTM Grade 356, conforming to the Aluminum Association Standards for Aluminum Sand and Permanent Mold Castings, Washington, D.C., March 1980.
- (b) Construction. The housing and fitter must conform in detail and dimensions to Electrical Standard Drawing 931. Each casting must be made by the permanent mold process; sand castings will not be acceptable. Minimum thickness will be 3/16", excluding the fitter attachment to the pole, and will be uniform within each casting and throughout all castings in an entire order. Inconsistencies in casting thickness will be cause for rejection of the entire lot.

- (c) Appearance. Castings will have smooth external surfaces free from protuberances, dents, cracks, or other imperfections marring their appearance. Welding or plugging of casting defects is prohibited. The housing will be of a similar design as manufactured by Lumec Inc., Luminaire Catalog Series RN20. The fitter will be of a similar design as manufactured by Lumec Inc., RN20 Style Catalog # LMS14343A. Similar designs must be approved by the Commissioner. The Commissioner's decision of what constitutes a similar design will be final.
- (d) Housing. The housing must enclose the lamp socket, reflector, terminal block, fuse holder(s) and ballast components, with provision for proper mounting of these parts. The housing must be of such size and surface area, or must have "heat sink" characteristics, such that all enclosed components will operate within their designed operating temperatures under expected service conditions.
- (e) Fitter. The fitter attachment to the pole mast arm must provide the structural integrity to hold the luminaire firmly in place during the vibrations anticipated due to wind loading, passing elevated trains and heavily loaded vehicles. Two 3/8-16, stainless steel (type 304) U-shape bolts must be used to secure the fitter to the pole mast arm. A minimum of 3/4" thickness of metal will be provided where the U-bolts are inserted to minimize the possibility of stripping the threads when the hardware is tightened into place. The hardware must include 3/8" x 16 threaded, stainless steel bolts and nuts; four sets of nuts and washers must be provided where the cobra-head style leveling device and fitter attaches to mast arm. The U-bolts must be properly installed and torqued in accordance with the manufacturer's written installation instructions as referenced in the SUBMITTAL INFORMATION REQUIRED Section of this Specification. The fitter must be securely threaded into the cast housing such that it will remain an integral part of the luminaire during the vibrations described above.

#### **CAST HOUSING AND FITTER PAINTING**

- 5. (a) Oil and Grease Removal. All metal surfaces must be washed with an alkaline detergent to remove any oils or grease.
- (b) Chemical Pretreatment. The cleaned metal surfaces must be rinsed with de-ionized water, treated with a hot, pressurized phosphate wash and sealer, rinsed again with de-ionized water, and then 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 four mil thickness in a one coat application. This powder coat must be cured in a convection oven at a minimum 400°F 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 must be capable of passing 1,000 hours of salt spray exposure as per ASTM B117 in a 5% Na Cl (by weight) solution at 95°F and 95% relative humidity without blistering. Before 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" must be not less than 3.0 mils.
- (g) Color. Preferred color will be gloss black. A 4" square color chip sample must be submitted for approval prior to fabrication. The chip sample must be of the same material as the capital, and must include the manufacturer's name and the manufacturer's color name as well. The sample must also include any other information which will be required to purchase the same color for the poles and split pedestal bases. Preferred color will be equal to Morton Powder Coat #20-7345.

#### **ACRYLIC REFRACTOR**

- 6. (a) Material/Construction - The refractor must be molded of clear, UV resistant V825 HID acrylic resin. The refractor exterior must be smooth to shed dirt and pollutants. Any prismatic necessary must be on the interior of the refractor. The refractor will be of a similar design as manufactured by Lumec Inc. Catalog # RN20-AC.
- (b) Appearance - The refractor must conform to that shown on Electrical Standard Drawing 931.

- (c) Refractor Mounting - The refractor must be mounted by means of a hinge assembly with stainless steel, captive screws mounted into the cast aluminum fixture housing. An asymmetric refractor will be clearly marked and keyed "HOUSE SIDE" and "STREET SIDE", so that it will be properly installed to provide the required photometrics. The mounting will afford the rigidity necessary to prevent the refractor from twisting or rattling when subjected to the vibrating forces of wind loading, passing elevated trains or heavily loaded vehicles. Mounting will include bolt torquing in accordance with the manufacturer's written installation instructions as referenced in the SUBMITTAL INFORMATION REQUIRED Section of this Specification. The mounting must not preclude any refractor from being mutually interchangeable with any other refractor intended for this function.

### **ELECTRICAL COMPONENTS**

7. (a) Lamp Holder. The lamp holder must be a glazed porcelain lamp-grip socket, mogul base, with a nickel-plated shell and spring loaded center contact rated for a minimum of 4KV pulsing. It must be a street lighting grade, commercially available product. The lamp holder must be properly secured in the factory and must not require field adjustment for optimum photometric performance.
- (b) Terminal Block and Fusing. A divisible-type terminal block of molded phenolic plastic must be provided within the housing in a readily accessible location. 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 the factory-provided fuse holder(s) which take "small dimension" (13/32" x 1-1/2") cartridge fuses. The fuse holder(s) must be standard, 600 volt fuse holder(s) with bayonet-type knob, and must be factory-wired to the appropriate terminals. 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. Fuses shall be rated at 10 amps, 600VAC, and 100,000 AMPS interrupting capacity.
- (c) Ballast Requirements.
1. General. The electronic ballast must incorporate a microprocessor to provide optimum starting and operation of a pulse-start metal halide lamp. It must be designed to furnish proper electrical characteristics for starting and operating a 250 watt, pulse-start metal halide lamp at temperatures as low as minus 40°F. The ballast must be multi-voltage able to operate within the voltage range of 180 to 305 volts.

2. Lamp Operation. The electronic ballast must provide positive lamp ignition at an input voltage of 190 volts at 240 volts nominal. It must operate the lamp over a range of input voltage from 220 to 254 volts without damage to the ballast.
3. Rating. The electronic ballast must have non-fading, color coded wire leads for rated input voltage of 240 volts at 60 cycles. The design range of input voltage for this ballast must be from +6% to -8% of the nominal voltage.
4. Lamp Current. The electronic ballast must supply current in accordance with the lamp manufacturer's recommendations, during operation and start-up.
5. Power Factor. The power factor of the electronic ballast over the design range of input voltages specified above must not be less than 90%.
6. Line Current. With nominal input voltage applied, the input current under starting, short circuit, or open circuit condition, must not exceed the lamp manufacturer's recommendations.
7. Lamp Wattage. The electronic ballast must deliver 250 watts to a horizontal burning pulse-start metal halide lamp when operating at the nominal input voltage. Wattage input to the nominal lamp must not vary more than a total of 30% over the input voltage design range specified above.
8. The electronic ballast input current must have Total Harmonic Distortion (THD) of less than 15% when operated at nominal line voltage.
9. The electronic ballast must have a lamp end-of-life detection and shutdown circuit.
10. The electronic ballast must have an output frequency higher than 100KHz.
11. The electronic ballast must be thermally protected to shut off when operating temperatures reach unacceptable levels.
12. The electronic ballast must meet the requirements of the FCC rules and regulations, Title 47 CFR, part 18.



13. The electronic ballast must be UL certified.

14. Short or Open Circuit. The electronic ballast must be capable of sustaining short circuit or open circuit conditions for extended periods without damage.

- (d) Crest Factor. Current crest factor must not be greater than 1.0 at nominal input voltage for a nominal horizontal burning lamp.
- (e) Mounting. The ballast components must be mounted and fastened on the component mounting plate or tray in a manner such that the components will remain secure and capable of withstanding the vibrations and shocks likely to occur when installed and in service. These components must be readily removable for replacement. All ballast components must be mounted to a single galvanized steel plate, which will be secured to the housing by a sliding captive rail system or other approved method. When the ballast housing door is opened, the entire assembly will be removed from the housing by sliding out the assembly and lifting it off of the captive position. Each component must be readily removable for replacement. Quick disconnects must be provided for this purpose. Alternate methods may be considered.
- (f) Noise Level. The noise level of this ballast must be such that when installed in the luminaire and operating, no objectionable audible or radio noise will be detected from directly beneath the luminaire when field tested in the actual installation and mounted on a steel pole at a 30' light center height.
- (g) Measurements and Tests. Measurements and tests, where required, must be made with a nominal lamp burning in the luminaire and the ballast operating at a stabilized temperature.
- (h) Wiring. The lamp holder and ballast 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. 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.

(i) Component Mounting.

1. Modular Construction. All electrical components must be securely mounted to a modular plate in such manner that individual components can be easily maintained or replaced. Permanent straps or tie-wraps will not be permitted. Provisions must be included to secure the component mounting plate in its "disconnected" position to allow easy access to terminal blocks and components for installation and maintenance. The entire assembly should be easily disconnected and removed for replacement.
2. Interchangeability. Component mounting plates must be mutually field interchangeable so that units can be restored to working condition without trouble shooting components.
3. 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.

- (j) Slip-fitter. The slip-fitter must be suitable for attachment over the end of either a one and a quarter inch (1-1/4") or a two inch (2") steel pipe inserted against a built-in pipe stop, and provided with an approved means of clamping firmly in place. It must have an adequate "clamping length" and permit a secure grip on the pipe by means of a clamp arrangement, or a saddle type clamping sleeve, subject to approval, in order to assure a stable attachment which must withstand jarring, vibration, and wind and ice loads. The slip-fitter must be designed to permit adjustment of not less than three (3) degrees above and below the axis of the mounting bracket to compensate for slight misalignment. Unless otherwise specified in the proposal, the slip-fitter will be set for a 2-inch pipe mounting. The slip-fitter will contain an approved shield around the pipe entrance to block entry of birds.

- (k) Reflector. The optical system must be designed to perform properly and efficiently with a reflector. The reflector must be made of hydroformed aluminum sheet of a grade quality such that the reflecting surface must have a specular finish and the reflection factor of the reflecting surface, as determined by the A. H. Taylor or Baumgartner Reflectometer, must not be less than 78%. The reflecting surface must have a dense protective coating of oxide not less than  $0.0116\text{mg/mm}^2$  (7.5 milligrams/in<sup>2</sup>), applied by the anodic oxidation process. The reflector must have a reverse flange to prevent direct light radiation on the gasket surface. The reflector must be held securely within the housing in a manner such that it can be readily removed and replaced. Reflector mounting must provide proper mating with the refractor. A silicone rubber, EPDM (ethylene propylene diene monomer), or EPR (ethylene propylene rubber) gasket must be fixed in place to seal between reflector and refractor. A “breathing” filter of Fiberglass or other approved material must be incorporated in the reflector for sealed optical units. It must effectively filter out dirt and particle size contaminants. The optical unit as a whole must provide an IES Medium Cut-off Type III distribution.
- (l) Refractor Holder-Door. The refractor holder-door must be a precision, aluminum ASTM Grade 356 permanent mold casting which must be hinged to the luminaire housing and must open downward approximately 90 degrees to allow servicing of the lamp. The hinging arrangement must be of rugged construction with corrosion resistant hinge fittings. The hinge must prevent the refractor-holder from disengaging and dropping in case it should swing open. The door must also be connected to the housing with a stainless steel cable. The refractor must be securely held in the holder-door, yet will be easily removed by means of a double action, quick release, corrosion resistant latch. When closed, the refractor holder-door must lock the refractor in precise optical alignment with the lamp, and with positive pressure against the sealing gasket. A sturdy, positive-acting, spring loaded latch will permit single-glove-handed release, and on closing of the refractor, holder-door must provide a definite snap action or visual indication that it is locked.
- (m) Reflector Gasket. This gasket will be a silicone rubber, EPR (ethylene propylene rubber), or EPDM (ethylene propylene diene monomer) molded, cavity type gasket of an approved cross section.
- (n) Hardware. All machine screws, locknuts, pins and set screws necessary to make a firm assembly, and for secure attachment of the luminaire to the mast arm, must be furnished in place. All hardware will be of stainless steel, copper silicon alloy, or other approved non-corrosive or suitably protected metal, and where necessary must be plated to prevent electrolytic action by contact with aluminum.

## **PHOTOMETRIC REQUIREMENTS**

29. (a) Parameters. The manufacturer must demonstrate that the luminaires will meet or exceed the specified photometric requirements under the following set of conditions. The manufacturer must provide photometric calculations using published luminaire data as part of the submitted package. The responsible material 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 in accordance with I.E.S. recommendations. 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. The program(s) used to perform the calculations must be identified in the submittal.
- (b) Unless otherwise indicated, the light distribution will be I.E.S. classified as medium-cutoff-Type III (M-C-III), as defined in the "American National Standard Practice for Roadway Lighting" approved June 27, 2000 by the "American National Standards Institute" (ANSI).
- (c) Verification of Data. All photometric data will be based on the parameters listed above. This data will be verified by an independent testing laboratory or manufacturer's laboratory as approved by the Commissioner. All testing must be performed on completed luminaires.

(d) Measurement Parameters.

- |   |  |
|---|--|
| 1. Observer eye height:                       | 4.75 feet above grade.   |
| 2. Line of sight of observer:                 | Downward one degree below horizontal; parallel to edge of roadway along lines 1/4 roadway lane width from edges of each lane (2 lines per lane). |
| 3. Lighting system:<br>mounting heights long. | Smooth and level, at least 10  |
| 4. Points per line:                           | At least 10, not more than 16 feet apart.  |
| 5. Roadway area covered:                      | All points between 2 luminaires on one side of side of roadway, centerline to curbeline.   |
| 6. Parkway area covered:                      | All points between 2 luminaires behind, and at least three ahead of calculation point.   |
| 7. Calculation point:                         | At least one luminaire behind, and at least three ahead of calculation point.  |
| 8. Luminaire:                                 | Tilt will be 0 degrees.  |

(e) Given Conditions.

- |                       |                          |
|-----------------------|--------------------------|
| 1. Right of Way Width | 66 feet                  |
| 2. Pavement Width     | 50 feet                  |
| 3. Number of lanes    | 4                        |
| 4. IES Surface        | R3                       |
| 5. Mounting Height    | 30 feet                  |
| 6. Mast Arm Length    | 8 feet                   |
| 7. Pole set back      | 3 feet                   |
| 8. Lamp               | 250 watt clear MH-PS     |
| 9. Lamp position      | Horizontal or Vertical   |
| 10. Lumens            | 22000                    |
| 11. IES Distribution  | Medium-Cutoff - Type III |

- 12. Light Loss Factor .7
- 13. Pole Spacing 110 feet
- 14. Configuration Two sides - Opposite

Overhang 5 feet

(f) Performance Requirements.

- 1. Roadway Illuminance:
  - Average Horizontal 2.5 fc
  - Uniformity Ratio Av/Min 3:1
  - Uniformity Ratio Max/Min 6:1
- 2. Roadway Luminance:
  - Average Luminance 1.6 cd/m2
  - Uniformity Ratio Av/Min 3:1
  - Uniformity Ratio Max/Min 6:1
  - Max Veiling Luminance 0.3

**TESTING**

- 9. (a) Testing. At a maximum, luminaire testing will be conducted on two percent of the manufacturer's production models for each order in which the quantity of luminaires is 50 or more. The number of tests and the type of tests will be as required by the Commissioner. The testing will include photometric and electrical testing, and additional testing. All testing must be certified by the manufacturer, or an independent lab.
- (b) The selection of luminaires must be a random selection from the entire completed lot of luminaires.
- (c) The Contractor must be responsible for all costs associated with the specified testing, including but not limited to shipping, travel and lodging costs as well as the costs of the tests themselves, all as part of this contract
- (d) Photometric testing must be in accordance with IES recommendations except that the selected luminaires will be tested as manufactured without any disassembly or modification. The photometric tests must be conducted with a reference lamp and ballast. The reference lamp must be installed in a manner recommended by the lamp manufacturer and the optical assembly must not be specially prepared for the tests. The tests, as a minimum, must yield:

30. An isofootcandle chart with maximum candela and half maximum candela trace.
31. An isocandela diagram
32. Maximum plane and maximum cone plots of candela
33. A candlepower table (house and street side)
34. A coefficient of utilization chart
35. A luminous flux distribution table
36. Complete calculations based on photometric specified requirements and test results herein.

(e) Electrical testing must conform to NEMA and ANSI standards and, as a minimum, must yield:

37. A complete check of wiring connections
38. A ballast dielectric test
39. Total ballast losses in watts and percent of input.
40. A lamp volt-watt trace
41. Regulation data
42. A starter test
43. Lamp current crest factor
44. Power factor (minimum over the design range of input voltage at nominal lamp voltage)
45. A table of ballast characteristics showing input amperes, watts and power factor, output volts, amperes, watts and lamp crest factor as well as ballast losses over the range of values required to produce the lamp volt-watt trace.

(f) Additional Types of Testing. The following tests must be performed by the approved testing laboratory:

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 degree Centigrade 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. The heat test must be conducted and certified by an independent lab.
3. Vibration testing in accordance with ANSI Standard C136.31/1. Upon completion of the tests, all set screws, castings, and components must be carefully examined to determine whether there has been a compromise in the security of the luminaires, mounting and/or components. Where the security of the luminaire is judged to have been compromised, the luminaire must be rejected.

46. 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.
- (g) The summary report and the test results must be certified by the independent test laboratory or the manufacturer's laboratory, as applicable, and must be sent directly to the Commissioner before the luminaires are shipped. The Commissioner may require some or all of the tests mentioned.
- (h) Should any of the tested luminaires of a given distribution type and wattage fail to satisfy the specifications and perform in accordance with approved submittal information, the luminaire of that distribution type and wattage will be unacceptable and must be either replaced or corrected as directed by the Commissioner:
47. Corrections Made to Achieve Required Performance. In the case of corrections, the Contractor must advise the Commissioner in writing of corrections proposed, and must request a repeat of the specified testing. If the corrections are deemed reasonable by the Commissioner, the testing process will be repeated as defined in this Section. The number of luminaires to be retested must be the same quantity as originally tested. Prior to retesting, the submittal process must be repeated in its entirety if the proposed corrections differ from the approved submittal information. Luminaires which have been modified or corrected must not be retested without prior approval from the Commissioner.
- (i) Unless otherwise indicated, at least eight weeks advance notice is required for the Commissioner's travel. Coordination will be the Contractor's responsibility. Failure to coordinate arrangements and notice will not be grounds for additional compensation or extension of time.
- (j) The Contractor must provide the Commissioner with a Certified Letter from the manufacturer at least two weeks prior to travel indicating that all luminaires, testing procedures, testing apparatus and testing personnel will be on-site and prepared completely on the approved testing dates. Failure to provide this letter, or failure to comply with this letter once on site will cause all testing to be rejected, and will require corrective action as specified above.



**SHIPMENT AND DELIVERY**

10. (a) General. The luminaires must be carefully inspected at the factory prior to shipment to assure that they are complete and free of defects. When luminaires are stacked together, they must be supported with suitable spacers or must otherwise be protected from dents and other potential shipping damage. The spacing and protective materials must be suitable for and usable in the storage of the luminaires. All hardware must be packaged in a clear container and labeled.
- (b) Packaging. Each luminaire assembly must be securely packed in a suitable carton so that it will not be damaged by shipment and/or handling.
- (c) Marking. Each carton containing a luminaire must be clearly marked on the outside in letters not less than 3/8" tall with the legend: "CHICAGO 2000 TEARDROP LUMINAIRE W/ELECTRONIC BALLAST, MH-PS, IES TYPE M-C-III". The wattage, appropriate City Commodity Code Number, name of manufacturer, date of manufacture, and contract number under which the luminaire is furnished must also be clearly marked on the carton.
- (d) Delivery. Luminaires will be delivered to the Division of Electrical Operations at 2451 South Ashland in Chicago, or to another City location as indicated on the order. Luminaire information submitted for approval will include any recommendations of the Manufacturer for storage as required under this Contract.

**ELECTRICAL SPECIFICATION 1558C  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
MAY 31, 2012**

**ADVANCED TRANSPORTATION CONTROLLER AND CABINET(CONTRACTOR  
INSTALLED)**

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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.

- 1.2 If requested, 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 and all appurtenant wiring and equipment completely assembled as a working unit. This sample will be regarded as a finished production model and conformance or non-conformance to these specifications will be based on the sample submitted.
- 1.3 All tests as outlined herein or in the referenced specifications must be regarded as minimum requirements. The contractor must submit his testing procedure for approval prior to performing any testing functions. Upon successful completion of all testing, certified test reports must be submitted for each unit. Units not successfully passing these tests or lacking proper documentation will be rejected.
- 1.4 Standards. Equipment furnished under this specification must meet the appropriate requirements of the following standards organizations, as required within the body of this specification:

American Association of State Highway and Transportation  
Officials (AASTHO)  
American Society for Testing and Materials (ASTM)  
Institute of Transportation Engineers (ITE)  
Manual on Uniform Traffic Control Devices (MUTCD)  
National Electrical Manufacturers Association (NEMA)  
Occupational Safety and Health Administration (OSHA)  
Underwriters Laboratories (UL)

- 1.5 Standard Drawings. The Standard Electrical Drawing 962 “Load Switch and Conflict Assignment”, Standard Electrical Drawing 964 “Traffic Controller Cabinet Back Panel and Power Supply, 1 Of 2” and Standard Electrical Drawing 965 “Traffic Controller Cabinet Back Panel and Power Supply, 2 of 2” , and Standard Drawing 909 “Fiber Optic Patch Panel” are integral parts of this specification.
- 1.6 Manufacturers. The manufacturer of the controller and of each major component must demonstrate a knowledge of past production, or have been actively engaged in the sale and/or service of traffic signal controllers, cabinets, and the other equipment herein described, as demonstrated by a submitted list of comparable projects. The manufacturer must be a recognized company that manufactures ATC controllers, such as Econolite, McCain, Siemens, U.S. traffic, or equal.
- 1.7 Warranty. The manufacturer must warranty the performance and construction of the traffic signal controllers to meet the requirements of this specification, and must warranty all parts, components, and appurtenances against defects in design, material, and workmanship for a period of one (1) year after installation. In the event of defects or failures during this period, the manufacturer must repair and/or replace all defective or failed parts or appurtenances at no expense to the City.

## **2. CONTROLLER REQUIREMENTS**

- 2.1 ATC. The controller must be an Advanced Transportation Controller (ATC) meeting the requirements of the specification “Advanced Transportation Controller (ATC) Standard Version 5.2b” dated June 26,2006, and the requirements of NEMA-TS2-2003. 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 89 to 135 Volts a.c. The power consumed must be under 50VA.

- 2.3 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.
- 2.4 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.
- 2.5 Processor / Memory. At a minimum, the processor will be:  
  
Clock speed - 300MHz  
Non-volatile Memory - 32MB Flash  
DRAM - 64MB  
SRAM - 1MB  
  
(All memory and firmware must be stored in flash memory. No EPROMS will be allowed.)
- 2.6 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.
- 2.7 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%.
- 2.8 All printed circuit boards must be mounted vertically.
- 2.9 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.

- 2.10 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.
- 2.11 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.
- 2.12 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 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:

<b>CPC MSD Pin</b>	<b>Function</b>
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

**ACCESS POINT**

4. (a) The access point shall be capable of two-way communication with up to forty-eight (48) sensors. This information will then be communicated to a contact closure card in the traffic control cabinet via an Ethernet cable.
- (b) Microprocessor based device using LINUX operating system.
- (c) The access point shall be enclosed in a NEMA 4X rated cabinet with an IP67 rating.
- (d) The cabinet dimensions shall be no more than 12 inches by 8 inches by 4 inches. Weight: no more than 3 pounds.
- (e) Temperature: Must operate between -20° F. and +150° F.
- (f) The power shall be through the cable (48VDC). The power consumption must be no greater than 3 watts.
- (g) The access point shall have surge protection of at least 5KV.
- (h) Shall have an RJ-45 (female) access port for communications and power from master contact closure card.
- (i) Two-way radio communications with 16 frequency channels, 2MHz bandwidth, frequency band: 2400 to 2483.5 MHz, and 250Kbps transmit/receive rate.
- (j) Antenna: micro-strip patch antenna with a field of view  $\pm 60^\circ$  (azimuth and elevation).
- (k) Wireless communications range: 200 feet.
- (l) Programmable via Ethernet cable.
- (m) Mount. The enclosure must be bolted to an adjustable mount. The mount shall be adjustable in both vertical and horizontal directions for proper aiming, and must be able to be securely locked in place. The mount shall be capable of being banded to a light pole.

**REPEATER**

5. (a) The repeater shall be capable of two-way wireless communication between up to ten (10) sensors and an access point. It shall be used when sensors are out of range of an access point.
- (b) The repeater shall be enclosed in a NEMA 4X rated cabinet with an IP67 rating.
- (c) The cabinet dimensions shall be no more than 5 inches by 4 inches by 4 inches. Weight: no more than 3 pounds.
- (d) Temperature: Must operate between -20° F. and +150° F.
- (e) The repeater shall have a communications range of at least 750 feet.
- (f) The repeater shall be battery powered. Batteries must have a lifetime of at least ten (10) years. Batteries shall be replaceable. Each battery shall be a 3.6 volt Li-SoCl<sub>2</sub> (lithium- sodium chloride) battery. The battery pack must have a nominal capacity of 7.2Ah.
- (g) Mount. The enclosure must be bolted to an adjustable mount. The mount shall be adjustable in both vertical and horizontal directions for proper aiming, and must be able to be securely locked in place. The mount shall be capable of being banded to a light pole.

**CONTACT CLOSURE CARDS**

6. (a) The contact closure cards (processor cards) must convert real-time detection signals into contact closure signals to the traffic controller. There will be two (2) types of cards: a contact closure master card and expansion cards.
- (b) Detection features must be compatible with City of Chicago specified traffic controllers.
- (c) Shall have optically isolated contact closure signals.
- (d) Shall have up to 4 channels per card.
- (e) Power consumption must not be more than 5 watts.
- (f) Bus interface: 44-pin standard detector card edge connector.



- (g) Voltage: must operate between 11 VDC and 26 VDC.
- (h) The detector card must plug into a standard NEMA detector rack. The front of the card must have a handle for easy replacement.
- (i) Temperature: Must operate between -20° F. and +150° F.
- (j) Humidity: Must operate between 10% to 95% relative humidity.
- (k) LED display on front of card: LEDs for each of four (4) channels must indicate on/vehicle present or no sensors, off/vehicle not present or channel disabled, blinking/vehicle detected. Additional LEDs for link, fault detection, and monitoring.
- (l) Controls: DIP switches or rotary dial on front for entering and resetting.
- (m) Interface with detection medium via RS 485 serial communications (Ethernet). Also two (2) RJ-45 connection points (female, in and out). Interface with other cards through front panel.
- (n) Each card shall have surge protection according to GR-1089 standards.

### **DETECTOR CARD RACKS**

- 7. (a) The rack shall be shelf mounted. Each rack must accept the contact closure processor cards, as specified herein. Each detector rack must meet NEMA standards and must be compatible with the standard City of Chicago traffic controller.
- (b) Racks must come in two sizes: a two detector card rack, and a four detector card rack.

### **POWER SUPPLY**

- 8. (a) The power supply must be compatible with the NEMA standard detector card rack.
- (b) The power supply must have a 120 volt AC input and provide regulated 24 volt DC output.
- (c) The power supply must be UL certified.

- (d) The front panel must have an indicator light and a fuse rated for 1.2 amps.  
The front panel must have a handle to facilitate maintenance.
- (e) Environmental:
  - a. Temperature Range: -20° F. to +150° F.
  - b. Humidity: 0 % to 95% relative humidity.

### **ACCESS BOX**

- 9. A small three (3) way access box must be included. The access box shall have two RJ-45 connection points for IN and OUT. This will be connected between the remote access point and the main contact closure card. The third input jack shall allow for a physical connection to a computer for programming.

### **SOFTWARE**

- 10. A software package shall be provided, if so requested, to set up and program the various functions of the wireless vehicle detection system. Software must be compatible with the portable lap top computers that are used by the City.

### **CABLE**

- 11. (a) Ethernet cables shall be provided. A short cable of two (2) feet with RJ45 connectors at each end shall be provided to connect the access box to the front of the master contact closure card. Another Ethernet cable of 150 feet in length with RJ45 connectors at each end shall be provided to connect the front of the master contact closure card (or access box) to the access point.
- (b) Standard male eight-position radio jacks (RJ45) shall be used at each cable end.
- (c) The cable shall meet TIA/EIA 568 – B.2 and EIA 485 standards and be rated as CAT5 or CAT5e cable.
- (e) The cable shall consist of copper conductors (20 to 28 AWG).

- (e) The cable shall consist of four (4) pairs of twisted insulated conductors in a shielded PVC jacket. The entire cable shall be rated for outside use in wet conditions.

**PACKING**

- 12. (a) All equipment must be packed, in clearly labeled cardboard containers, so that the contents will not be damaged in shipping or handling. Instructions must be included in each container.

2.13 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:

<b><u>I.63 Pin Connector</u></b>	<b>Function</b>
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	DS 1 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

- (4) The Setcon I/O connector will be resident on the HMC1000 version of the ASTC I/O.



<b>Setcon Clock Connector</b>	<b><i>PIN</i></b>	<b><i>Voltage</i></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

2.14 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). MIST is a product of Telvent-Farradyne. All available functions and capabilities that exist within existing MIST controllers must be available within this unit, as well as being compatible with the ATC LMD40 unit and the ATC NEMA 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.

2.15 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 must have 32 Pre-timed plans
  - a. Each plan will allow for up to 32 timing intervals
  - b. Each plan will allow for 64 circuit outputs. Each output must be individually programmable per interval.
- (6) The controller 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 must be possible to re-program the security codes if the previous security code is known or has been defeated.
  - b. It must not be possible to read the security code from the controller's display.
  - c. It must be possible to access the controller in the case of a lost security code through a "back door" which must be provided only by the controller manufacturer. This "back door" security code must change based upon the controller's internal calendar.

### **3. CONFLICT MONITOR**

- 3.1 General. Each controller must be furnished with a NEMA conflict monitor unit for checking for conflicts in the signal output circuits. The conflict monitor must be capable of monitoring a minimum of twelve (12) distinct channels. It must be a self-contained unit with its own power supply and not be located within the timer housing.
- 3.2 Programming Board. A removable programming board must be supplied with the monitor for programming signal compatibility. The circuits for programming must be composed of soldered jumper wires. Diode or dip switch type programming will not be acceptable. The programming board must contain no circuitry or components other than the wire jumpers and the wire jumper soldering devices.
- 3.3 Flashing Circuit Energizing. The conflict monitor must be programmed to put the controller in a flashing sequence upon detection of a failure or conflicting signal display. The controller must also be programmed to energize the flash circuit if the conflict monitor is removed or loses its supply voltage. The conflict monitor must have a manual reset button to return the controller to normal operation after conflict circuit operation is no longer necessary.
- 3.4 Stop Time Circuit. A stop-time control circuit must be supplied from the conflict monitor to force the timer unit to stop timing upon detection of a conflict.

- 3.5 Indicator. The front panel of the conflict monitor housing must have an indicator which will be activated when a conflict or failure occurs as per Section 6 of NEMA Spec. TS1-1983.
- 3.6 Latch Circuit. The conflict monitor must have a latch circuit, insuring that if a voltage monitor failure occurs, the intersection remains in conflict until reset.
- 3.7 Memory. The conflict monitor must have the ability to store, in memory, a minimum of ninety-nine (99) conflict events, including date of conflict and channels conflicting.

3.8 Conflict Monitor Assignments

- (1) Conflict monitor channels must be assigned as follows:

Channel 1	Load Switch 1	Phase 1 Vehicle
Channel 2	Load Switch 2	Phase 2 Vehicle
Channel 3	Load Switch 3	Phase 3 Vehicle
Channel 4	Load Switch 4	Phase 4 Vehicle
Channel 5	Load Switch 5	Phase 5 Vehicle
Channel 6	Load Switch 6	Phase 6 Vehicle
Channel 7	Load Switch 7	Phase 7 Vehicle
Channel 8	Load Switch 8	Phase 8 Vehicle
Channel 2W	Load Switch 9	Phase 2 Ped
Channel 4W	Load Switch 10	Phase 4 Ped
Channel 6W	Load Switch 11	Phase 6 Ped
Channel 8W	Load Switch 12	Phase 8 Ped
Channel 9	Load Switch 13	Overlap A
Channel 10	Load Switch 14	Overlap B
Channel 11	Load Switch 15	Overlap C
Channel 12	Load Switch 16	Overlap D

- (2) It must be possible for the user to change conflict assignments without unsoldering any connections.
- (3) All unused channels - vehicle or pedestrian - must be neatly tied or terminal mounted in such a manner that they are readily available in front of the panel. If tied, the harness wires must be labeled. If terminal mounted, the terminations must be labeled.
- (4) A terminal must be provided for the red enable feature.
- (5) A terminal must be provided for the hook up of any unused red channels to AC.

- (6) Controller monitoring must consist of; voltage monitor, 24 VDC I, 24 VDC II.
- (7) The output relay must operate a sixty (60) ampere, normally open, "A" type mercury contactor without the use of an external or "cabinet interface" relay.

#### 4. P TYPE CABINET

- 4.1 Housing. Each controller must be furnished completely housed in a Type 5052-H32 aluminum housing of 0.125 inch thickness. All cabinets must be provided with factory installed 1 1/8" x 1/2" deep channels. Four channels must be provided for each cabinet side and back. All shelves, panels and individual equipment items must be mounted to these channels using 1.0" channel nuts with 1/4-20 bolts. All items mounted on panels must be securely fastened by bolting into drilled and tapped holes. No pop rivet or similar fastening methods will be accepted. Cabinets must be P Type with nominal dimensions of 55" high by 44" wide by 26" deep. Manufacturer will be Erpel, Hennessy, Southern Manufacturing Company, or approved equals.
- 4.2 Door. The cabinet must have a main door and a police door hinged with one-quarter inch (1/4") minimum, continuous, removable stainless steel pins. The doors must be closely fitted to a neoprene gasket making the doors dust, water and weather resistant. The doors must be interchangeable with any other doors from any other controller in this order.
  - (1) Main Door. Opening of the main door must provide complete access to the cabinet interior. The door must be embossed, subject to approval, with the legend "CITY OF CHICAGO-TRAFFIC CONTROL" in letters at least one (1) inch high. The door must have stops at 90, 150 and 180 degrees, from the closed position. The door latch must have three (3) point locking with rollers at the ends of the latch rods. The latch handle must be capable of being padlocked. The key lock for the latch mechanism must be a Corbin cylinder lock with a #2 key. Two (2) keys must be furnished with each cabinet.
  - (2) Police Panel Door. The police panel door must be furnished with a lock for a modified Chicago police key per sample to be furnished to the successful bidder. This key must have a shaft of at least one and three quarter inches (1-3/4") in length. Two keys must be furnished with each cabinet.

- 4.3 Cabinet Ventilation. A fan, having a minimum air movement capacity of 100 CFM, must be mounted in the air baffle in the top of the cabinet with an air outlet built into the roof overhang. The main door must be louvered and equipped with a removable, standard, commercially available aluminum dust filter. The ventilation openings must be equipped with removable covers for summer operation. No external fan housings or air outlets will be allowed. Any other method must be approved.
- 4.4 Shelf. The cabinet must contain a vertically adjustable shelf large enough to accept the solid state controller and all other shelf mounted devices.
- 4.5 Size. The exterior dimensions of the cabinets will be approximately fifty-five (55) inches high by forty-four (44) inches wide by twenty-six (26) inches deep for P Type cabinets, and must conform to N.E.M.A. 3R pad mounted specifications. The bolt pattern must be a four (4) point pattern with the bolt notches being in the center of each side.
- 4.6 Finish. The exterior surfaces of the cabinet must be smooth. All drilled, tapped, or punched holes on the outer surface must be filled with liquid metal and ground smooth, and slotted screw heads must be ground smooth flush with surface. Bolts extending through cabinet wall must be round head, carriage, square shoulder type and fastened on the inside of the cabinet with an ESNa nut and necessary gaskets to insure the weatherproofing integrity of the cabinet. The finished cabinet must be thoroughly degreased in a wash process and dried in a heated chamber. A thermosetting, ultra violet resistant, polyester powder coat must be electrostatically applied to all cleaned and treated surfaces and cured to a hard, mar resistant finish in a heated chamber at a temperature recommended by the powder coat paint manufacturer. Exterior color must conform to Federal Standard 595, and either be City of Chicago green color No. 14110 or gloss black color. Exterior color must be as defined in the 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 un-fused 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, normally open, "A" type mercury contactor must be supplied for opening and closing the AC supply to the signal bus. The contactor must be mounted in such a manner on the power supply panel that accidental contact does not produce a safety hazard.
- 5.6 R.I.S. Filter: A radio interference suppression filter rated at sixty (60) amperes minimum must be installed in line with the main power supply, after the sixty (60) ampere circuit breaker.
- 5.7 Ground. The grounded side of the power supply must be continuous throughout the controller and must be grounded to the controller cabinet in an approved manner meeting OSHA requirements.
- 5.8 Polarity. The phase conductors of the signal circuits must have the same polarity as the phase side of the power supply, and the common conductor(s) must be of the same polarity as the grounded side of the power supply.
- 6. LOAD SWITCH BAY**
- 6.1 General. A panel must be provided for mounting the load switch jacks, flash transfer relay jacks, flasher jack, auxiliary relays, time clock jacks, switches, flash change combination terminals, and terminals for field signal connections under non-interconnected operation. See Standard Electrical Drawings 964 and 965.
- 6.2 Wiring. Panel wiring must be neatly laced and properly terminated individual conductors. They must be insulated and properly sized for their application.
- 6.3 Load Circuits. Each load circuit must be capable of carrying fifteen (15) amperes continuously at a temperature of 74°C (165° F).
- 6.4 Bus Feeds. Bus feeds must be capable of carrying fifty (50) amperes continuously at a temperature of 74° C (165° F).
- 6.5 Equipment. The wiring panel must include, but not be limited to, the following:

- (1) Ten (10) ampere fuses with barrier type fuse holders must be installed between the load switch signal output circuits and field terminals for signal light conductors. Each terminal must be the barrier type with sufficiently long screws to accept four (4) #12 AWG solid conductors. The terminals must be located at least two inches (2") above the bottom of the cabinet.
- (2) Switching Device. The signal load switching device must be a three (3) circuit, solid state, jack mounted load switch which meets the N.E.M.A. Publication TS-1, Part 5 requirements. Each load switch must be rated for a minimum fifteen (15) ampere continuous resistive load and must mate with an S-2412-SB panel socket. Sixteen (16) load switches are to be provided with each cabinet, as defined in the Contract Plans.
- (3) User Programmable Interface. Two (2) sets of terminal blocks must be provided between the machine logic output and the input side of the load switches. By terminating all machine logic output on one set of terminals and all load switch input to the other set, an interface is thus created by which the machine logic can be readily connected to any of the load switches by means of a jumper wire. The two (2) sets of terminal blocks must be conveniently located in close proximity to each other and must be arranged such that, initially, each function will be factory wired directly from one set of terminals to the other without the need to criss-cross wires between blocks.
- (4) Number of Signal Circuits:
  - a. Sixteen (16) load bay panel. Each panel must be equipped with sixteen (16) load switch jacks for a minimum of forty-eight (48) signal circuits.
  - b. All unused signal circuits must be neatly tied or terminated. If tied, the harness wire must be labeled. If terminated, each termination must be identified.

6.6 Identification. All field terminals must be suitably identified, subject to approval.



**7. FLASHING FEATURE**

- 7.1 General. The flasher must be a solid state device, with no contact points or moving parts, producing between 50 and 60 flashes per minute with a 40 to 50 percent duty cycle. The flasher mechanism must be mounted on a type P-406-SB plug which will mate with an S-406-SB socket on the controller panel. The flasher must utilize zero-point switching, with turn-on at the zero voltage point ( $\pm 5$  degrees) of the power line sinusoid.
- 7.2 Flasher Panel. A panel must be provided with one (1) terminal wired to the flasher and marked "FL". The panel must be equipped with terminals to provide or omit flashing of all red and yellow outputs.
- 7.3 Flasher Circuits. Flashers must provide two (2) output circuits to permit alternate flashing of signal phases and must be capable of carrying a minimum of twenty (20) amperes per circuit at 120 volts. The flasher must operate continuously so that flashing power will be available at the field terminal marked "FL". The flasher wiring must divide the loads imposed on the two (2) circuit flashers alternately on each phase.
- 7.4 Manual Flash. A manual flash switch must provide flashing indication for all circuits. The flash change combination terminals must allow the selection of flashing either yellow or red on the main and/or cross streets, or complete omission of the flashing feature if required.

**8. POLICE PANEL**

- 8.1 Auto-Off Flash Switch. Each controller must be provided with an auto-off-flash switch. In the "AUTO" position the signals must be on and the controller timing unit must run normally. In the "OFF" position the signals must be OFF and the controller timing unit must continue to run. In the "FLASH" position the signals must flash and the controller timing unit must continue to run. The auto-off flash switch must be located on the side of the police switch panel that faces outward when the police door is open.

- 8.2 Auto-Hand Switch. Each controller must 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 be supplied with each controller. It must be of an approved weatherproof construction with a six (6) foot, retractable, flexible, extension cord to allow connection to the appropriate terminals on the panel of the controller. It must not be possible to manually step through a vehicle clearance interval.
- 8.3 Terminal Block. A two point terminal block must be mounted on the back side of the police switch panel and the hand control circuit terminated on this block. This will be for installation of a hand control cord by others, as required.
- 8.4 Space Requirement. Adequate room must be provided in the police panel section to store the manual switch and retractable cord.
- 9. RELAYS**
- 9.1 Transfer Relays. Eight (8) double pole, double throw, flash transfer relays must be furnished with each controller. These relays must be jack mounted into an S-408-SB, or equivalent, socket mounted on the controller panel.
- 9.2 Contact Arm. Each contact arm must have over travel on the front and back contacts and be independent of any other contact arms. No adjustment of contact pressure or wipe must be necessary. Load capability must be a minimum of fifteen (15) amperes per contact continuously and thirty (30) amperes for one (1) minute. Contacts must be of coin or fine silver or an approved alternate.
- 9.3 Dust Cover. A suitable dust cover must be furnished for each relay.

- 9.4 Relay Mounting and Endurance. All relays supplied must meet their approved specified requirements and must have contacts which cannot be opened by unusual vibrations, shock, or momentary voltage excursions of up to 30%. All relays other than the flash and bus relay must be mounted on a molded base with eleven (11) or eight (8) pins for jack mounting to their respective panel or sub-base, and must be electrically interchangeable with those presently used by the City of Chicago ("MIDTEX", Model 158-92T200 or equal).

## 10. **COMMUNICATIONS INTERFACE PANEL**

- 10.1 Where a communications interface has been specified in the contract plans to allow a controller to function as a Master or Secondary controller, then one of the specified options must be provided:

- (1) Fiber Optic Communications Interfaces must meet the following requirements:
  - a. General. The fiber optic communications components must consist of, but not be limited to, an internal fiber optic modem within the controller or an external fiber optic modem, a fiber optic patch panel to interface the modem to field fiber optic cables, and fiber optic jumpers between the modem and patch panel.
  - b. The secondary fiber modules for the (local) controllers must either be the bi-directional type, as specified in the PROPOSAL or contract plans. All modems must be Electronic Industries Association (EIA) compatible for RS-232 data communications via fiber optic link. Modems must be multi-mode, operate at 850nm wavelength, and provide full-duplex, frequency modulated, asynchronous transmission at data rates of up to 38.4 kbps.
  - c. The fiber optic patch panel must consist of a 14" long by 5-3/4" wide by 3-1/4" high rack constructed in accordance with Standard Electrical Drawing #909. The rack must be designed to mount on the controller cabinet rails. "ST" type terminals, suitably labeled, must be provided for the connection of field fibers and Modem.

- d. The fiber optic jumpers (i.e., optical patch cords) must consist of a single multi-mode fiber in 900 micron orange jacket, with "ST" type connectors factory installed on each end. The jumpers must be 3' long in Secondary (i.e., local) controller cabinets. The jumpers must be connected to the patch panel and supported in such a manner that the minimum bending radius is ten (10) times the diameter of the cable, and the cables exert no strain on the connectors. Each jumper must have a minimum tensile strength of 50 lbs.
- (2) Copper Wire Interconnect Panels (Seven Wire, VAC) must meet the following requirements:
- a. General. The interconnect panel must serve to isolate interconnect VAC from the controller. The panel must consist of, but not be limited to, seven (7) relays. Each relay interconnect circuit must include an M.O.V. properly rated for protection against lightning and switching surges injurious to the controller and a barrier type 3AG fuse receptacle and fuse not to exceed five (5) amperes. Each panel must provide a seven (7) wire interface with the T.B.C. functions described below and must provide barrier type terminals suitably labeled for these functions.
  - b. The secondary interconnect panel must be wired in such a manner that an VAC input activates a relay sending an input from that relay to the controller. It must have a minimum of seven (7) relays for the following functions; Dial 2, Dial 3, Dial 4, Offset 1, Offset 2, Offset 3, M.U.T.C.D. flash.
  - c. The master interconnect panel must provide a means to establish outgoing VAC for a seven (7) wire interconnect system using eight (8) relays. The relays must have 24 VDC coils and be designated as, Dial 2, Dial 3, Dial 4, Sync, Offset 1, Offset 2, Offset 3, M.U.T.C.D. flash. The sync relay must be wired in such a manner that it provides the offset pulse to the contacts of the three (3) Offset relays.
  - d. Each relay must be a double pole type, with one pole designated as field interconnect output, and the other designated as controller input. Relay coils must be rated for continuous duty. Relay contacts must be rated for a continuous fifteen (15) AMP resistive load.

- e. A terminal strip must be mounted on the top of the master interconnect panel for controller interface.
- f. The master panel must interface with the T.B.C. terminals as described above.
- g. Each output must be fused as outlined above.

## **11. WIRING**

- 11.1 General. All electrical conductors must be stranded copper, with a minimum of nineteen (19) strands per conductor, and a concentrically applied 90° C insulation with a 600 VAC rating. Wiring from the fuse block to the first distribution point, and to the controller bus, must be No. 10 AWG. Signal circuit wire must be No. 14 AWG. The wires must be provided with lugs or other approved terminal fittings for attachment to binding posts. All wiring between various parts of the controller must be neatly cabled. All wiring and terminal blocks must be tested for possible short circuits and resistance to ground by a high voltage dielectric test at 1,200 VAC. A wiring harness of adequate length must be provided to the timing device to allow the timer to be placed on top of the cabinet when required.
- 11.2 All VAC connections to load switches, flasher, and flash transfer relays must be soldered. All VAC connections on back of terminals must be soldered.
- 11.3 All VDC connections on back of terminals, and load switches must be soldered or connected with pre-approved terminations. All VDC connections to load switches are to be soldered or connected in a manner pre-approved by the City of Chicago's Division of Electrical Operations.

## **12. TESTING REQUIREMENTS**

- 12.1 General. The testing on the controllers must be done as described herein. Environmental testing must be done at the manufacturer's facilities or at an independent laboratory, and must be certified by the manufacturer or the independent laboratory. Functional testing will be done at the City's facilities. All controllers provided under the contract must be tested as stipulated under "Functional Burn-In Testing" and Physical Inspection at the manufacturer's facilities. The manufacturer shall program and test the controller at the factory and certify the test results.

- 12.2 N.E.M.A. Environmental Test. One controller, unless approved previously, must be tested, at the manufacturer's expense, in accordance with Part 2 of NEMA Standards Publication TS1-1983. All of the tests listed must be performed with all data properly recorded and certified. If the manufacturer changes the design, fabrication or components of a previously tested and approved controller, then a sample of the controller containing the new design, fabrication or components must be retested at the manufacturer's expense. Any N.E.M.A. environmental test references to minimum recall must include but not be limited to: all sixty-four (64) output circuits must be programmed in a sequence to simulate the normal functioning of the entire controller cabinet assembly; the conflict monitor must have a test board with the allowable channel jumpers installed to simulate normal operation; all thirty-two (32) intervals must be programmed with a minimum of two (2) seconds per interval.
- 12.3 Functional "Burn In" Testing. The manufacturer of the controller must perform, at his manufacturing facilities, a one hundred (100) hour "burn-in" test on every controller, conflict monitor, and appurtenant devices. This test period must be certified by the manufacturer with supportive documentation and must include the device serial number, dates and times of test periods, and results. Any failed, or nonconforming components, must be replaced at this time. After each component has passed the "burn-in" test, they may be used in the assembly of the complete controller unit. Each completed unit must be subjected to the seventy-two (72) hour function test as described in this specification. The "burn-in" requirement must include a test that uses all sixty-four (64) output circuits in "solid" burn as well as 1 pps and 5 pps for each circuit. All thirty-two (32) intervals must be programmed with a minimum of two (2) seconds per interval. The documentation for a test program to simulate the controller phasing must be supplied. A copy of the test program must be approved by the City of Chicago's Division of Electrical Operations prior to testing. Certification of these tests must be attached to the outside of the shipping container. The certification is in addition to any other documentation and/or testing required by these specifications.
- 12.4 Performance Testing Requirements. In addition to the NEMA environmental test and the requirements stated above, satisfactory performance of the traffic signal cabinet and its equipment must be demonstrated prior to shipment from the factory. The manufacturer must submit five (5) copies of his proposed "Test Procedure Document" for approval with the sample requested above. The test procedure must consist of two (2) sections; physical inspection and functional testing. If the test procedure is judged by the Commissioner or his duly authorized representative to be incomplete, inadequate or otherwise deficient, the contractor must revise and resubmit his "test procedure document" until it is approved. No controller will be accepted until the "test procedure document" has been approved.

- 12.5 Performance Testing Documentation. Upon completion of the performance testing, two (2) certified copies of the final results of the approved "Test Procedure Document" must be included with all traffic signal controller production shipments.
- 12.6 Functional Testing of Model of Controller. If the controllers proposed for the project have not been previously tested for the City, then a sample of one of the controllers must be tested as follows: testing must include, but not be limited to, phasing for multiple legged intersections, bridge and railroad pre-empts, flash operation, actuation, and any combinations of these features. Controllers designed to function without railroad pre-empts must be shown to function without the presence of a railroad interconnect. Options for downward compatibility when replacing either HMC1000 controllers or LMD40 controllers must also be demonstrated. In addition, it should be demonstrated that the sample controller functions within the MIST system.
- 12.7 Physical Inspection. The "physical inspection" portion of the test procedure document requires the manufacturer to perform a physical inspection of workmanship and specification compliance for each traffic signal controller assembly. The inspection must be done using a detailed check list defining items to be inspected and criteria for acceptance. The inspection must include, but not be limited to, the following items:
- (1) Hardware installation.
  - (2) Assembly mounting.
  - (3) Dimensions.
  - (4) Presence of specified devices and materials.
  - (5) Presence of required documents.
  - (6) Labeling and required serial numbers.
  - (7) Wiring, including routing, covering, gauge, length, and soldering of terminations.
  - (8) Arrangement of equipment for safety and ease of calibration, reprogramming, troubleshooting and maintenance.
  - (9) Condition of cabinet body and finish.
  - (10) Condition and installation of doors, panels, gaskets and ventilation.
  - (11) High voltage test of insulation resistance to ground, with wires installed in cabinet and equipment disconnected.

12.8 Functional Testing. The "functional testing" portion of the Test Procedure requires 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. Each controller should be programmed according to the timing requirements of the contract plans. 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.



**CHICAGO ATC MATRIX - TABLE A**

Since the ATC standard specifies a “family” of controllers, the following options have been selected from the ATC standard (ATC Standard Version 5-2b, June 26, 2006) 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>
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	3.5.1.5	Required	

blocks of data	4.1.5		
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 serial port (SP5) is to be used exclusively for supporting a parallel I/O module (NEMA TS2 or legacy interface)</li> </ul>
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 "Port 4". 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 5".
Front Panel Serial Ports	6.2.3.2 6.1.3 6.3.2.2	Required	One serial port shall satisfy this section as an EIA-485 (15-pin) with the TS2 Type 1 Port 1 pin-out and be labeled "Port 1".
Front Panel Ethernet Ports	6.2.3.9 6.3.2.9 7.1.4.4	Required	There shall be a minimum of two Ethernet ports on the Front Panel (one for ENET1, one for ENET2)
User Interface	7.1 7.1.1.2 7.1.4.4 7.1.4.5 7.1.4.7	Required	
User Interface	7.1.1	Required	Must meet City's Minimum requirements
User Interface	7.1.1.1 7.1.2.1 7.1.3 7.1.4.1 7.1.5	Required	<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 128 rows x 240 columns (up to 16 lines x 40 characters).</li> <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</li> </ul>

			<p>needed and User is interacting with the controller locally (due to battery backup requirements).</p> <ul style="list-style-type: none"> <li>Heater Power shall be up to 15V 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 (12 volt not required)
Mechanical/Chassis	7.3.1.3 7.3.1.4	Required	<ul style="list-style-type: none"> <li>Only Shelf mounted units are acceptable</li> <li>Only components / connectors specified by the City shall be located on the Front panel. 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	Required	<ul style="list-style-type: none"> <li>Support for TS2 Type 2 and TS1 Interfaces</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	8.2.1	Required	<ul style="list-style-type: none"> <li>No support for Model 332</li> </ul>

required			Cabinets or ITS Cabinets & devices is to be provided
Environmental & Test Procedures	9	Required	All subsections are required
Performance & Material Requirements	10	Required	All subsections are required
Performance & Material Requirements	10.1.15	Required	All PCBs and similar construction mechanisms shall be mounted vertically (i.e. no horizontal PCBs are allowed).
Quality Control	11	Required	All subsections are required

**ELECTRICAL SPECIFICATION 1563  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
OCTOBER 22, 2010**

**TEARDROP LUMINAIRE, CHICAGO 2000, ELECTRONIC BALLAST 210/315 WATT  
CERAMIC METAL HALIDE LAMP; I.E.S. CUTOFF TYPE III DISTRIBUTION**

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**SUBJECT**

1. This specification states the requirements for a street lighting luminaire, with electronic ballast, to provide horizontal burning of either a 210 watt (24,200 lumens) or 315 watt (37,800 lumens) ceramic metal halide lamp. The overall shape of the luminaire shall be historic teardrop. Light distribution will be I.E.S. medium cut-off Type III. The luminaire must include a fitter and must be fabricated for attachment to a 2" O.D. steel mast arm on a Chicago 2000 light pole.

**GENERAL**

2. (a) Information Required. Each bidder must submit with his proposal the following information relative to the luminaire he proposes to furnish:
  1. Manufacturer certification of compliance.
  2. Manufacturer shop drawings and product data.
  3. Photometric calculations and data.
  4. Certified test reports and statements.
  5. Projected area in square feet.
  6. Luminaire efficiency.
  7. IES formatted photometric curve in electronic format.
- (b) Sample. If requested by the Chief Procurement Officer, one completely assembled luminaire with fitter and integral components, of the manufacture intended to be furnished, must be submitted for review within sixty (60) business days from the receipt of notice.

- (c) Assembly. Each luminaire must be delivered completely assembled, wired, and ready for installation; with the fuses. It must consist of the cast housing, refractor, and fitter as shown on Electrical Standard Drawing 931; reflector, lamp holder assembly, terminal block, electronic ballast, gaskets, and all necessary hardware.
  
- (d) Hardware. All machine screws, locknuts, pins and set screws necessary to make a firm assembly, and for secure attachment of the luminaire to the mast arm, must be furnished in place. All hardware will be of stainless steel, copper silicon alloy, or other approved non-corrosive or suitably protected metal, and where necessary must be plated to prevent electrolytic action by contact with aluminum.
  
- (e) Warranty. The manufacturer must 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 five (5) years after delivery to the City or acceptance of the project, whichever applies. This will be interpreted particularly to mean failure of the ballast, failure of any component, loss of reflectivity of any reflecting surface, discolorations or fogging of any portion of the optical system impairing the transmission of light, and any failure in the paint surface. The reflector, the refractor or lens, and the entire optical assembly must not develop any discoloration over the normal life span of the luminaire. Any luminaire or part thereof not performing as required or developing defects within this period, must be replaced by the manufacturer at no cost to the City. The Commissioner will be the sole judge in determining which replacements are to be made and the Commissioner's decision will be final. Any cost for the warranty as specified will be incidental to this contract.



**CAST HOUSING AND FITTER**

3. (a) Material. Each housing and fitter must be cast aluminum, ASTM Grade 356, conforming to the Aluminum Association Standards for Aluminum Sand and Permanent Mold Castings, Washington, D.C., March 1980.
- (b) Construction. The housing and fitter must conform in detail and dimensions to Electrical Standard Drawing 931. Each casting must be made by the permanent mold process; sand castings will not be acceptable. Minimum thickness will be 3/16", excluding the fitter attachment to the pole, and will be uniform within each casting and throughout all castings in an entire order. Inconsistencies in casting thickness will be cause for rejection of the entire lot.
- (c) Appearance. Castings will have smooth external surfaces free from protuberances, dents, cracks, or other imperfections marring their appearance. Welding or plugging of casting defects is prohibited. The housing will be of a similar design as manufactured by Lumec, Spring City, or Hadco. Similar designs must be approved by the Commissioner. The Commissioner's decision of what constitutes a similar design will be final.
- (d) Housing. The housing must enclose the lamp socket, reflector, terminal block, fuse holder(s) and ballast components, with provision for proper mounting of these parts. The housing must be of such size and surface area, or must have "heat sink" characteristics, such that all enclosed components will operate within their designed operating temperatures under expected service conditions.

- (e) Fitter. The fitter must be suitable for attachment over the end of a two inch (2") steel mast arm inserted against a built-in pipe stop. The slip-fitter must be designed to permit adjustment of not less than three (3) degrees above and below the axis of the mounting bracket to compensate for slight misalignment. The fitter attachment to the pole mast arm must provide the structural integrity to hold the luminaire firmly in place during the vibrations anticipated due to wind loading, passing elevated trains and heavily loaded vehicles. Two 3/8-16, stainless steel (type 304) U-shape bolts must be used to secure the fitter to the pole mast arm. A minimum of 3/4" thickness of metal will be provided where the U-bolts are inserted to minimize the possibility of stripping the threads when the hardware is tightened into place. The hardware must include 3/8" x 16 threaded, stainless steel bolts and nuts; four sets of nuts and washers must be provided where the cobra-head style leveling device and fitter attaches to mast arm. The U-bolts must be properly installed and torqued in accordance with the manufacturer's written installation instructions. The fitter must be securely threaded into the cast housing such that it will remain an integral part of the luminaire during the vibrations described above. The slip-fitter will contain an approved shield around the pipe entrance to block entry of birds.

#### **CAST HOUSING AND FITTER PAINTING**

4. (a) Oil and Grease Removal. All metal surfaces must be washed with an alkaline detergent to remove any oils or grease.
- (b) Chemical Pretreatment. The cleaned metal surfaces must be rinsed with de-ionized water, treated with a hot, pressurized phosphate wash and sealer, rinsed again with de-ionized water, and then 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 four mil thickness in a one coat application. This powder coat must be cured in a convection oven at a minimum 400°F 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% Na Cl (by weight) solution at 95°F and 95% relative humidity without blistering. Before test, the panel must be scribed with an "X" down to bare metal.
- (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" must not be less than 3.0 mils.
- (g) Color. Preferred color will be gloss black. A 4" square color chip sample must be submitted for approval prior to fabrication. The chip sample must be of the same material as the capital, and must include the manufacturer's name and the manufacturer's color name as well. The sample must also include any other information which will be required to purchase the same color for the poles and split pedestal bases.

#### **OPTICAL ASSEMBLY**

- 5. (a) The optical assembly will consist of the reflector, the refractor, the refractor/reflector holder-door, gasketing, and all associated items. The optical assembly will be a sealed unit. The unit will be rated IP66 for ingress protection for dust and water. This will be accomplished with the lamp holder screwed into the reflector opening. The optical unit as a whole must provide an IES Medium Cut-off Type III distribution.

#### (b) REFRACTOR

Material/Construction. The refractor shall be pressed crystal clear, heat-resistant, boro-silicate glass, well annealed, homogeneous, and free from imperfections and striations. It must contain prisms pressed on the inside surface and where necessary on the outside surface, and must be optically designed to redirect by refraction the light from the lamp and reflector to produce the desired light pattern.

Appearance The refractor must conform to that shown on Electrical Standard Drawing 931.

(c) REFLECTOR

Reflector. The optical system must be designed to perform properly and efficiently with a reflector. The reflector must be made of hydroformed aluminum sheet of a grade quality such that the reflecting surface must have a specular finish. The reflection factor of the reflecting surface, as determined by a reflectometer using the fiber-optic method, must not be less than 75%. The reflecting surface must have a dense protective coating of oxide not less than  $0.0116\text{mg/mm}^2$  (7.5 milligrams/in<sup>2</sup>), applied by the anodic oxidation process. The reflector must have a reverse flange to prevent direct light radiation on the gasket surface. Reflector mounting must provide proper mating with the refractor.

(d) MOUNTING

Refractor/Reflector Mounting The refractor and the reflector must be mounted so that it is not possible to install incorrectly. The assembly will be installed so that the "HOUSE SIDE" and "STREET SIDE" are properly aligned to provide the required photometrics. The mounting will afford the rigidity necessary to prevent the refractor from twisting or rattling when subjected to the vibrating forces of wind loading, passing elevated trains or heavily loaded vehicles.

Refractor/Reflector Holder-Door. The holder-door must be a precision, aluminum ASTM Grade 356 permanent mold casting which must be hinged to the luminaire housing and must open downward approximately 90 degrees to allow servicing of the lamp. The hinging arrangement must be of rugged construction with corrosion resistant hinge fittings. The hinge must prevent the holder-door from disengaging and dropping in case it should swing open. The door must also be connected to the housing with a stainless steel cable. The refractor and reflector must be securely held in the holder-door. The entire assembly should be easily disconnected for replacement. When closed, the holder-door must lock the assembly in precise optical alignment with the housing. The holder-door assembly with reflector and refractor will be a sealed unit. A sturdy, positive-acting, spring loaded latch will permit single-glove-handed release, and on closing, the holder-door must provide a definite snap action or visual indication that it is locked.

Gasketing. A silicone rubber, EPDM (ethylene propylene diene monomer), or EPR (ethylene propylene rubber) gasket must be fixed in place to seal between reflector and refractor. A "breathing" filter of Fiberglass or other approved material must be incorporated in the reflector for sealed optical units. It must effectively filter out dirt and particle size contaminants.

## **ELECTRICAL COMPONENTS**

6. (a) Lamp Holder. The lamp holder must accept a lamp with an ANSI PGZ18 base and must be rated for a minimum of 4KV pulsing. It must be a street lighting grade, commercially available product. The lamp holder must be properly secured in the factory and must not require field adjustment for optimum photometric performance.
- (b) Terminal Block and Fusing. A divisible-type terminal block of molded phenolic plastic must be provided within the housing in a readily accessible location. 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 the factory-provided fuse holder(s) which take "small dimension" (13/32" x 1-1/2") cartridge fuses. The fuse holder(s) must be standard, 600 volt fuse holder(s) with bayonet-type knob, and must be factory-wired to the appropriate terminals. 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. Two (2) KTK 10 amp fuses must be included. The fuses must be rated for 600 VAC at 100,000 AMPs interrupting capacity.
- (c) Ballast Requirements.
  1. General. The electronic ballast shall be a low frequency square wave type. The electronic ballast must provide optimum starting and operation of a ceramic metal halide lamp. It must be dual wattage and designed to furnish proper electrical characteristics for starting and operating either a 210 watt or a 315 watt, ceramic metal halide lamp at temperatures as low as minus 20°F. The ballast must be able to operate within the voltage range of 200 to 277 volts.
  2. Lamp Operation. The electronic ballast must provide positive lamp ignition at an input voltage between 208 volts and 277 volts.

3. Rating. The electronic ballast must have non-fading, color coded wire leads for rated input voltage of 240 volts at 60 cycles.
  4. Lamp Current. The electronic ballast must supply a nominal 3.2 amperes to a 315 watt lamp in accordance with the lamp manufacturer's recommendations, during operation and a maximum of 5.0 amperes at start-up. For the 210 watt lamp, the ballast must supply a nominal 2.2 amperes during operation and a maximum of 3.5 amperes at start-up.
  5. Power Factor. The power factor of the electronic ballast over the design range of input voltages specified above must not be less than 95%.
  6. Line Current. With nominal input voltage applied, the input current under starting, short circuit, or open circuit condition, must not exceed 1.7 amperes at 208 volts nominal, and 1.23 amperes at 277 volts nominal.
  7. Lamp Wattage. The electronic ballast must deliver either 210 watts or 315 watts to a horizontal burning ceramic metal halide lamp when operating at the nominal input voltage. Wattage must not vary by more than  $\pm 5\%$ .
8. The electronic ballast input current must have Total Harmonic Distortion (THD) of less than 15% when operated at nominal line voltage.
9. The electronic ballast must have a lamp end-of-life detection and shutdown circuit.
10. The electronic ballast must be thermally protected to shut off when operating temperatures reach unacceptable levels.
11. The electronic ballast must meet the requirements of the FCC rules and regulations, Title 47 CFR, part 18.
12. The electronic ballast must be UL certified.
13. Short or Open Circuit. The electronic ballast must be capable of sustaining short circuit or open circuit conditions for extended periods without damage.

14. Ballast Losses. Wattage loss of the ballast must not exceed 30 watts for the 315 watt lamp. Wattage loss of the ballast must not exceed 21 watts for the 210 watt lamp.
  15. Crest Factor. Current crest factor must not be greater than 1.5 at nominal voltage for a nominal horizontal burning lamp.
  16. Surge Protection. The electronic ballast must have internal surge protection. In lieu of this, external surge protection must be provided. Lightning and surge protection must be rated for 10kV/5kA.
- (d) Mounting. The ballast must be mounted and fastened on the component mounting plate or tray in a manner such that the ballast will remain secure and capable of withstanding the vibrations and shocks likely to occur when installed and in service. The ballast must be readily removable for replacement.
- (e) Noise Level. The noise level of this ballast must be such that when installed in the luminaire and operating, no objectionable audible or radio noise will be detected from directly beneath the luminaire when field tested in the actual installation and mounted on a steel pole at a 30' light center height.
- (f) Measurements and Tests. Measurements and tests, where required, must be made with a nominal lamp burning in the luminaire and the ballast operating at a stabilized temperature.
- (g) Wiring. The lamp holder and ballast 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. 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) 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. Provisions must be included to secure the component mounting plate in its "disconnected" position to allow easy access to terminal blocks and components for installation and maintenance. 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.
3. 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.

**PHOTOMETRIC REQUIREMENTS**

7. (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 III (M-C-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(0.8 light loss factor):

3.	Roadway Illuminance:	
	Average Horizontal	2.5 fc
	Uniformity Ratio Av/Min	3:1
	Uniformity Ratio Max/Min	6:1
4.	Roadway Luminance:	
	Average Luminance	1.6 cd/m <sup>2</sup>
	Uniformity Ratio Av/Min	3:1
	Uniformity Ratio Max/Min	6:1
	Max Veiling Luminance	0.3

(d) If the luminaires are not for a specific project, then the luminaires must meet the performance requirements for the following physical conditions.

For the 210 watt lamp:

Right-of-way	100'
Curb-to-curb	70'
Mounting height	30'
Setback	3'
Arm length	8'
Spacing (Opposite)	100'
Pavement	R3

For the 315 watt lamp:

Right-of-way	100'
Curb-to-curb	70'
Mounting Height	30'
Setback	3'
Arm length	8'
Spacing (Opposite)	110'
Pavement	R3

**TESTING**

8. (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:
- 48. An isofootcandle chart with maximum candela and half maximum candela trace.
  - 49. An isocandela diagram.
  - 50. Maximum plane and maximum cone plots of candela.
  - 51. A candlepower table (house and street side).
  - 52. A coefficient of utilization chart.
  - 53. A luminous flux distribution table.
- (d) Electrical testing must conform to NEMA and ANSI standards and, at a minimum, must yield:
- 54. A ballast dielectric test.
  - 55. Total ballast losses in watts and percent of input.
  - 56. A lamp volt-watt trace.
  - 57. Regulation data.
  - 58. Power factor.
  - 59. A table of ballast characteristics.
- (e) Electronic Ballast Testing. In addition to ballast testing listed above:

1. Initial testing (0 hour testing). using resonance ignition, OCV (open circuit voltage) shall meet ANSI latest standards lamp specification
  - (a) Ballast short circuit current (assuming the electronic ballast does not incorporate a circuit to turn off the output)
  - (b) Any Automatic shut off features
  - (c) Any rectification protection features
  - (d) Ballast losses (system efficiency)
  - (e) Current waveform shape
  - (f) Record initial waveform and characteristics at plus/minus 10% and at nominal input voltage
  - (g) Record OCV (open circuit voltage) waveforms and operational frequencies, and OCV characteristics at plus/minus 10% and at nominal input voltages
  
2. Test at 100 hour. Lamps have been operating for at least 100 hours:
  - (a) Test Lamps data sheet
  - (b) Photometry data for test lamp operated with the test ballasts shall be recorded and compare data for the same lamps operated with ANSI reactors
  - (c) Maximum lamp power voltage output deviation
  - (d) Results for voltage and current waveforms for re-ignition voltage, crest factors, power factor
  - (e) Record at room temperature and in the dark, lamp full-arc time (within ANSI time limit)
  - (f) Record starting time under cold box condition (lamps at -30F) at minus 10% nominal ballast input voltage
  - (g) Hot restrike time
  - (h) Record any acoustic resonance or arc instability under the full range of lamp operating position
  - (i) Record any change of OCV (open circuit voltage) or ignition waveform
  
3. Lifetime Testing. Life testing for a minimum of 20 percent of rated lamp life at nominal ballast input voltage, with a minimum of 6 test ballasts and 6 control ballasts.
  - (a) Record photometry and electrical maintenance on lamps operating on control, and test ballasts
  - (b) Record all end-of-life lamp characteristics and effects on ballasts
  - (c) Record lamp X-rays life effects, electrode wear, and arc-tube deterioration

(f) Additional Types of Testing.

2. 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, and will not include the lamp and fuses. However, the luminaire must be fully operational after the test.

60. 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.

**SHIPMENT AND DELIVERY**

9. (a) General. The luminaires must be carefully inspected at the factory prior to shipment to assure that they are complete and free of defects. When luminaires are stacked together, they must be supported with suitable spacers or must otherwise be protected from dents and other potential shipping damage. The spacing and protective materials must be suitable for and usable in the storage of the luminaires. All hardware must be packaged in a clear container and labeled.
- (b) Packaging. Each luminaire assembly must be securely packed in a suitable carton so that it will not be damaged by shipment and/or handling.
- (c) Marking. Each carton containing a luminaire must be clearly marked on the outside in letters not less than 3/8" tall with the legend: "CHICAGO 2000 TEARDROP LUMINAIRE W/ELECTRONIC BALLAST, 210/315 WATT CMH, IES TYPE M-C-III". The appropriate City Commodity Code Number, name of manufacturer, date of manufacture, and contract number under which the luminaire is furnished must also be clearly marked on the carton.

**ELECTRICAL SPECIFICATION 1573  
DIVISION OF ELECTRICAL OPERATIONS  
DEPARTMENT OF TRANSPORTATION  
CITY OF CHICAGO  
APRIL 8, 2010**

**WIRELESS VEHICULAR DETECTION SYSTEM**

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**SUBJECT**

1. This specification states the requirements for a wireless vehicular detection system (WVDS) to be used for vehicular actuation of traffic control signals. The system shall consist of wireless in-pavement vehicle detectors, a pole mounted transceiver/transmitter (access point), wireless repeaters, processor cards (contact closure cards), and related equipment to be used in conjunction with traffic controllers used by the City of Chicago.

**GENERAL**

2. (a) Standards. The WVDS shall meet National Electrical Manufacturers' Association (NEMA) standards and Federal Communications Commission (FCC) Class B, Part 15 standards.
- (b) Sample. Samples of each part of the system, of the manufacture proposed to be furnished, must be submitted along with specification sheets within fifteen (15) business days upon request of the Chief Procurement Officer. The samples shall be delivered to the Division of Electrical Operations, 2451 South Ashland Avenue, Chicago, Illinois 60608.
- (c) Warranty. The manufacturer shall warrant each component of the WVDS to meet the requirements of this specification, and shall warrant all components against defective design, material and workmanship for a period of five (5) years from date of acceptance. In the event that defects or failures occur during the warranty period, the manufacturer must repair and/or replace all defective materials at no expense to the City. This warranty must be evidenced by a letter or certificate of warranty submitted to the City at the time final delivery is made. The warranty must cover all units delivered in an order. The warranty must be signed by an official of the manufacturer who is empowered by the manufacturer to enter into such an agreement.

- (d) Compatibility. Each component of the WVDS must be compatible with every other component of the system and with the traffic signal controller equipment used by the City of Chicago. Any equipment proposed that does not exactly meet these specifications may be considered, as long as it is demonstrated that the equipment is compatible and provides the functions required for proper operation of the traffic controller. The acceptance or rejection will be determined solely by the Commissioner of Transportation or his duly authorized representative.
- (e) The WVDS shall consist of wireless in-pavement sensors, an access point (wireless transmitter/receiver to sensor, but hardwired to contact card), a wireless repeater (wireless transmitter/receiver to communicate between sensors and an access point, if necessary), a detector rack with power supply, a contact closure card, expansion contact closure cards (if necessary), an access box (for configuration and programming the system), application software, and cable.

### **WIRELESS SENSOR**

- 3. (a) The sensor shall be housed in a hardened plastic enclosure classified as NEMA 6P, with an IP 68 rating (IP=Ingress Protection).
- (b) The enclosure shall be approximately three (3) inches by three (3) inches with a depth of not more than three (3) inches. It shall be designed for being mounted in the pavement, flush with the wearing surface.
- (c) The sensor shall be able to be installed and removed easily in a small core drilled hole.
- (d) The sensor shall be battery powered. Batteries must have a lifetime of at least ten (10) years. Batteries shall be replaceable. Each battery shall be a 3.6 volt Li-SoCl<sub>2</sub> (lithium- sodium chloride) battery. The battery pack must have a nominal capacity of 7.2Ah.
- (e) Vehicle detection shall be by a 3-axis magnetometer. Sampling rate at 128 Hertz.
- (f) Two-way radio communications with 16 frequency channels, 2MHz bandwidth, frequency band: 2400 to 2483.5 MHz, and 250Kbps transmit/receive rate.
- (g) Programmable via wireless communications.

- (h) Antenna: micro-strip patch antenna with a field of view  $\pm 60^\circ$  (azimuth and elevation).
- (i) Temperature: Must operate between  $-20^\circ$  F. and  $+150^\circ$  F.
- (j) Communication Range: a minimum of 200 feet.
- (k) Must be compatible with pole mounted transmitter/receiver (access point or repeater) and wireless vehicular detector system.
- (l) Must be individually addressable.
- (m) Must be able to detect vehicles for left turn detection, cross-street detection, counting vehicles, etcetera.

**APPENDIX B – CHICAGO DEPARTMENT OF WATER MANAGEMENT (CDWM)  
TECHNICAL SPECIFICATIONS FOR WATER MAIN CONSTRUCTION**

This specification amends the Chicago Department of Water Management (CDWM) Technical Specifications for Water Main Construction included in Appendix B and shall be construed to be a part thereof, superseding any conflicting provisions thereof applicable to the work under the Contract:

1. Revise all references to the Commissioner to the Engineer.
  
2. Section 33 11 13
  - a) Delete Article 1.2.
  - b) Delete Articles 1.6 A, B, C, D.
  - c) Modify Article 1.6 E to “All existing valves must be operated only be personnel of the Department of Water Management. Notify the Department of Water Management seventy-two (72) hours prior to the need for operation of the valve.”
  - d) Modify Article 2.2 B to “Pipe joints must be restrained joints noted on the Drawings, specified here, or as directed by the Engineer.”
  - e) Delete Article 2.2 E.
  - f) Delete Article 2.6.
  - g) Delete Article 2.7.
  - h) Modify Article 3.4 B to delete “specified in Section 33 11 15 Thrust Restraint,”.
  - i) Modify Article 3.4 C to delete “as per Section 33 23 19 Dewatering Excavations”.
  - j) Modify Article 3.4 D to delete “in accordance with Section 31 23 10 Excavation, Trenching and Backfilling”.
  - k) Delete Article 3.5.
  - l) Delete Article 3.7.
  - m) Delete Article 3.9.
  - n) Modify Article 3.13 to delete “CLSM flowable material must meet standards specified in Section 31 23 10, “Excavation, Trenching and Backfilling”, paragraph 2.3, C of these specifications.”
  - o) Modify Article 3.14 A to delete “as specified in Section 31 23 10, “Excavation, Trenching and Backfilling”.
  - p) Modify Article 3.14 B to “All new pipe, fittings, and valves must be disinfected per requirements of the Bureau of Water Quality which may be contacted at 312.744.8190.”



3. Section 33 12 20
  - a) Modify Article 1.1 A to “This Section includes requirements for construction and/or adjustment of water main valve basins using precast concrete structures.”
  - b) Delete Article 1.2.
  - c) Delete Article 1.4 A.
  - d) Modify Article 1.4 B to “Shop Drawings: Submit detailed drawings of precast utility structures and related metal work.”
  - e) Modify Article 2.1 A to “Fabrication standards – Circular precast concrete base and riser sections furnished for valve basins must conform to ASTM C478.”
  - f) Delete Articles 2.6, 2.7, 2.8, and 2.9.
  - g) Delete Article 3.1, 3.3.
4. Section 33 12 16
  - a. Modify Article 1.1 A to delete “resilient wedge valves”.
  - b. Delete Article 1.2.
  - c. Modify Article 1.4 A to delete “butterfly”.
  - d. Modify Article 1.5 C to delete “Gate”.
  - e. Modify Article 2.1 M to replace “Department” with “Engineer”.
  - f. Modify Article 2.1 M to replace all instances of “Department” with “Engineer”.
  - g. Delete Article 2.2.
  - h. Delete Article 2.4.
  - i. Modify Article 3.1 A to “All valves will be tested as specified on the drawings”.
  - j. Delete Article 3.3.

Section 33 12 19 – No deletions or modifications to this section

## SECTION 33 11 13

# DUCTILE IRON WATER PIPE AND FITTINGS

### PART 1 - GENERAL

#### 1.1 DESCRIPTION OF WORK

- A. This section includes requirements for the installation of ductile iron water pipe and fittings as shown on the drawings and specified here.

#### 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 33 11 15 - Thrust Restraint.
- D. Section 33 13 00 - Disinfection and Testing of Water Mains.

#### 1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM), latest edition:
  - 1. AWWA C104 - Cement Mortar Lining for Ductile Iron Pipe and Fittings.
  - 2. AWWA C105 - Polyethylene Encasement for Ductile-Iron Pipe Systems.
  - 3. AWWA C110 - Ductile-Iron and Gray-Iron Fittings.
  - 4. AWWA C111 - Rubber Rubber-Gasket Joints for Ductile-Iron Pressure pipe and Fittings.
  - 5. AWWA C115 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
  - 6. AWWA C116 - Protective Fusion-Bonded Epoxy Coatings Int. and Ext. Surf. Ductile-Iron/Gray-Iron Fittings.
  - 7. AWWA C150 - Thickness Design of Ductile-Iron Pipe.
  - 8. AWWA C151 - Ductile Iron Pipe, Centrifugally Cast.
  - 9. AWWA C153 - Ductile Iron Compact Fittings for Water Service.
  - 10. ASME/ANSI B16.1 - Flanges and Flanged Fittings.
  - 11. ANSI B16.21 - Metallic Gaskets for Pipe Flanges.
  - 12. ASME B18.2.1 - Square and Hex Bolts and Screws.
  - 13. ASME B18.2.2 - Square and Hex Nuts.
  - 14. ASTM A123 - Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.

15. ASTM A153 - Zinc Coating (Hot Dip) on Iron and Steel.
16. ASTM A240 - Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip, for Pressure Vessels and for General Applications.
17. ASTM A307 - Carbon Steel Bolts and Studs.
18. ASTM A536 - Ductile Iron Castings.
19. ASTM A767 - Zinc Coated (galvanized) Steel.
20. ASTM A775 - Epoxy Coated Steel.
21. ASTM A780-93 - Repair of Zinc Coated (Galvanized) Steel.
22. ASTM B308 – Stainless Steel Alloy Standard Structural Shapes, Rolled, or Extruded.
23. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
24. ANSI A21.5/AWWA C105 - Polyethylene Encasement.

#### 1.4 SUBMITTALS

- A. Refer to Book I 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 his intention to purchase or place a special order for any pipe required to be installed under this contract. Fully dimensioned drawings and/or manufactures catalog cuts are to be submitted for review.
- C. The Contractor must submit to the Commissioner certified copies of all test reports for test conducted on the pipe by the manufacture when so requested by the Commissioner.
- D. The Contractor must provide the Commissioner with a notarized statement that all tests have been made and met as specified.

#### 1.5 QUALITY ASSURANCE

- A. Each manufacturer supplying pipe for water mains under this contract must furnish all facilities, personnel, and materials to conduct tests required as applicable to the type of pipe being supplied, when requested by the Commissioner. The cost of all plant tests required as proof of the acceptability of the water main pipe 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 plumber licensed in the State of Illinois or the City. This Work must include, but not be limited to, joining all pipe and fittings, installing joint gaskets, assembling all joints, installing continuity wedges, and tightening all gland nuts and bolts, as applicable for the installation.**

1.6 NOTIFICATION AND LIMITATIONS OF WATER MAIN SHUT DOWNS

- A. **Whenever an existing water main or a section thereof is to be shut down during the course of construction, every individual consumer must be notified at least seventy-two (72) hours prior to the shut down. The Contractor must never operate, under any circumstances, an existing valve for a shut down or other purpose without first notifying and obtaining approval from the Commissioner.**
- B. **The time for a consumer shut down must not exceed eight (8) hours. Absolutely no shut downs will be permitted before 8:00 AM without approval from the Commissioner.**
- C. In case of emergency shut downs, the Contractor must notify customers immediately. Notification may be verbal on a door-to-door basis. However, if a consumer cannot be contacted, a written notice must be placed at the property site showing all pertinent information regarding the shut down. The notice must show a telephone number the consumer may call for information or to express any problem that the consumer may have with the shut down.
- D. If a consumer cannot withstand a planned shut down due to a dialysis machine being present or other medical reason, the Commissioner must be notified immediately.
- E. All valves 16-Inches in diameter and larger must be operated only by personnel of the Department. Notify the Commissioner seventy-two (72) hours prior to the need for operation of the valve.

## PART 2 - PRODUCTS

### 2.1 DUCTILE IRON PIPE

- A. Ductile iron pipe must conform to the requirements of AWWA C151 and with the additions or substitutions specified in this Section.
- B. Pipe bells must be designed to provide a watertight joint without leakage and must be capable of withstanding pressures exceeding those that will rupture pipe of this class and thickness without requiring additional jointing material.
- C. Electrical conductivity must be provided at each joint on all push-on and mechanical jointed pipe 16-Inches in diameter and smaller, to facilitate thawing of frozen pipe and building water services. It must also be provided on pipe 24-inches in diameter and larger when building services are directly connected to the water main. Conductivity is to be accomplished by installing serrated silicon wedges as recommended or supplied by the pipe manufacture. **The use of lead tip gaskets will not be allowed.** Wedges are to be installed in accordance with the requirements of paragraph C in Articles 3.6 and 3.7 of this specification.
- D. All pipes 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.
- E. Exterior of pipe must be coated with a petroleum asphaltic material in conformance with AWWA C110, Section 10-10. Interior of pipe must be cement lined in accordance with AWWA C104.
- F. Pipe thickness and classes must conform to standards shown in Table A.

**TABLE A PIPE THICKNESS AND CLASS**

Pipe Size	Nominal Wall Thickness	Thickness Class
3-inch	0.34-inch	54
4-inch	0.38-inch	55
6-inch	0.40-inch	55
8-inch	0.45-inch	56
10-inch	0.47-inch	56
12-inch	0.49-inch	56
14-inch	0.48-inch	55
16-inch	0.46-inch	54
18-inch	0.44-inch	53
20-inch	0.45-inch	53
24-inch	0.50-inch	54
30-inch	0.47-inch	52
36-inch	0.53-inch	52
42-inch	0.59-inch	52
48-inch	0.65-inch	52
54-inch	0.73-inch	52
60-inch	0.77-inch	52

2.2 JOINTS

- A. **LEAD JOINTS ARE NOT TO BE USED UNDER ANY CIRCUMSTANCES.**
- B. Pipe joints must be push-on type joints unless otherwise noted on the drawings, specified here, or directed by the Commissioner. Push-on type joints must conform to AWWA C111.
- C. Restrained joints when specified are to meet the following requirements:
  - 1. Mechanical joint pipe with mechanical joint restraint glands. Mechanical joints must conform to AWWA C110. Gaskets must conform to Section 2.4 of this specification.

2. Restrained joint pipe with manufactured weldment, field weldments or manufactured locking rings, locking segments and runner retainers and appurtenances conforming to AWWA C110. Acceptable products are Super-Lock Pipe manufactured by Clow Water Systems Company; FlexRing Pipe or Lok-Ring Pipe manufactured by American Ductile Iron Pipe; or TRFLEX manufactured by United States Pipe and Foundry Company.

D. Mechanical Joint Restraint Glands.

1. Provide restraint glands at all mechanical joints.
2. Restraint glands must be designed for use with the standardized mechanical joint bell pipe conforming to AWWA C110 and AWWA C153. Restraint is to be incorporated into the design of the gland. Acceptable products for this use are Mega Lugs manufactured by EBAA Iron Works; Uniflange manufactured by Ford Meter Box; or Star Grip manufactured by Star Pipe Products.
3. Restraint is to be accomplished by the use of multiple, wedge style restraints. Proper actuation of the wedges is to be ensured with torque limiting twist off nuts.
4. Glands 3-Inches through 16-Inches are to be pressure rated at 350-psi; glands 18-Inch through 48-Inch are to be rated at 250 psi.
5. The gland body and restraint components are to be made from ductile iron conforming to ASTM A536, 65-45-12. Ductile iron wedges are to be heat-treated within a range of 370 to 470 BHN.
6. The joint is to be capable of full deflection during assembly and joint deflection after assembly
7. Provide glands with minimum weights and number of wedges as shown in Table B.
8. Retainer glands are not acceptable.

**TABLE B – MINIMUM WEIGHT & NUMBER OF WEDGES PER RESTRAINED JOINT**

Pipe Size.	Number of Wedges	Minimum Weight
3-inch	2	6.0-lbs
4-inch	2	7.0-lbs
6-inch	3	11.0-lbs
8-inch	4	14.5-lbs
10-inch	6	23.0-lbs
12-inch	8	28.5-lbs
14-inch	10	46.0-lbs
16-inch	12	52.0-lbs
18-inch	12	63.6-lbs
20-inch	14	71.0-lbs
24-inch	16	90.0-lbs
30-inch	20	190.7-lbs
36-inch	24	226.5-lbs
42-inch	28	400.0-lbs
48-inch	32	488.0-lbs

- E. Flanged joints, when shown on the Drawings, specified, or directed by the Commissioner, must conform to the following:
1. Flanged joints must conform to AWWA C115. Flanges must be the long hub type, screwed on the threaded end of the pipe in the shop. There must be no leakage through the pipe threads. The flanges must be designed to prevent corrosion of the threads from the outside.
  2. Flanges must be drilled according to the requirements of ANSI/ASME B16.1, Class 125 unless special drilling is called for on the Drawings, specified, or directed by the Commissioner. Bolt holes must be equally spaced, drilled smooth and true. When stud bolts are used flanges must be drilled and tapped to accommodate the studs.



3. The face of the screwed-on flange and plain-end of the pipe must be accurately refaced together, at right angles to the pipe axis. After facing and drilling, the face of the screwed-on flange must immediately be covered with an appropriate rust-preventive coating.
4. Flanged joints must be secured with either bolts and nuts, or stud bolts with a nuts. Bolts, stud bolts, and nuts must meet the requirements of ASTM A307, Grade B. Bolts and stud bolts must conform to ANSI/ASME B18.2.1. Nuts must conform to ANSI/ASME B18.2.2. All bolts, stud bolts, and nuts must be primed with bitumastic paint after the bolts and nuts have been installed and tightened.
5. Gaskets must conform to Section 2.4 of this specification.

### 2.3 FITTINGS

- A. Fittings to be furnished and installed as specified or shown on the Drawings must be mechanical joint, ductile iron in accordance with AWWA C110. Laying length of mechanical joint castings must be as shown in AWWA C110. Wall thickness and allowable variation in the thickness of mechanical joint castings must conform to AWWA C110 and have a 250-psi pressure rating.
- B. Compact fittings may not be used unless otherwise approved by the Commissioner.
- C. Plain ends of mechanical joint fittings must be beveled and gauged to properly seat in push-on joint bells.
- D. The fittings must be smooth and free from defects of every nature that would make them unfit for the use that they were intended. Plugging of fittings is not allowed. Repairing of defects by welding will be allowed if such repairs will not adversely affect the serviceability of the fittings or their ability to meet the strength requirements of the referenced AWWA standards.
- E. All castings must be coated with a petroleum asphaltic material in conformance with AWWA C110, Section 10-10. Interior of pipe must be cement lined in accordance with AWWA C104.
- F. Flanged fittings must conform to AWWA C110, and have a 150-pound per square inch pressure rating.

## 2.4 GASKETS

- A. All gaskets for pipe, fittings and appurtenances must be vulcanized natural or vulcanized synthetic rubber, non-porous, free of foreign materials and visible defects. Recycled rubber may not be used.
- B. When soil conditions do not permit the use of natural or synthetic rubber gaskets and when directed by the Commissioner, all gaskets for pipe, fittings and appurtenances must be Nitrile (acrylonitrile butadiene), nonporous, free of foreign materials and visible defects.
- C. Gaskets for flanged joints must be of the ring type, 1/16-Inch thick, and meet the requirements of ANSI Standard B16.21. Acceptable manufactures for gaskets type as manufactured by the Crane Company; Garlock Packing Company; or U.S. Rubber Company.
- D. Gaskets must be stored in a cool place and protected from light, heat, oil, or grease until installed. Any gasket showing signs of cracking, weathering, abrasion or other deterioration will be rejected.

## 2.5 POLYETHYLENE ENCASEMENT

- A. Polyethylene encasement material must be either 8-mil, low density or 4-mil, cross-laminated, high-density polyethylene tubing in accordance with AWWA C105.

## 2.6 TRANSITION SLEEVES

- A. Transition sleeves for pipe 16-inches in diameter and smaller must be of type as manufactured by Dresser, Style 253 Modular Cast Couplings; Smith Blair, Type 441 Cast Transition Couplings; Ford, Style FC2A Transition Couplings; Power Seal, Model 3501 Transition Couplings; or JCM Industries Model 212 Transition Couplings. Transition sleeves for pipe diameter greater than 16-inches must be of type as manufactured by Ford, Style FC2A or Style FC5 Transition Couplings; Romac Industries, Style 501 Transition Couplings; Dresser Style 38, Style 62, or Style 138 Transition Couplings; or Power Seal, Model 3501 Transition Couplings.
- B. Transition sleeves must be designed to join class "B" pit cast iron pipe to AWWA C111/C151 standard ductile iron pipe. They must provide for pipe misalignment and settlement deflection and make a leak proof non- soldered joint, which allows for limited line movement due to expansion and contraction. Design couplings for a minimum rated working pressure of 150-pounds per square inch.

- C. Transition sleeves pipe 16-Inches in diameter and smaller must be constructed of ductile iron conforming to ASTM A536. Transition sleeves for pipe diameters greater than 16-Inches must be constructed of ductile iron conforming to ASTM A536 or carbon steel conforming to ASTM A36. Ends must have a smooth inside taper for uniform gasket seating. The follower flanges must be ductile iron conforming to ASTM A536 or carbon steel conforming to ASTM A36.
- D. Transition sleeves must be shop coated inside and outside with fusion bonded epoxy coating conforming to AWWA C-213.
- E. Gaskets must be of molded rubber conforming to ASTM C564 for potable water service.
- F. Bolts and nuts must be 5/8-Inch in size and must be Grade 304L stainless steel, annealed. Nuts must be Teflon coated to prevent galling during storage.
- G. Each transition sleeve must be supplied with four electrical continuity brackets electrical continuity across the sleeve. The angle bracket must be made from ASTM A240-T304 stainless steel with a stainless steel set screw.
- H. Contractor must field measure the existing cast iron water main for exact size of outer dimension and degree of out-of-roundness at the location to install the transition sleeve prior to ordering and installing the transition sleeve for that location.

2.7 PIPE SUPPORT SYSTEMS AND HANGERS (INTENDED FOR PERMANENT INSTALLATIONS)

- A. Manufactured pipe support systems, fasteners, and miscellaneous hardware must be fabricated from high strength stainless steel conforming to ASTM B308, or hot-dipped galvanized steel conforming to ASTM 123 and ASTM 153. Pipe support systems must be designed to have a minimum load safety factor of three (3) times the anticipated loading.
- B. Field fabricated pipe support systems, fasteners, and miscellaneous hardware must be cold-galvanized by painting metal surfaces with a 2-mil thick coating of ethyl silicate in-organic zinc-rich paint primer per manufacture's directions. Galvanized primer must be completely dry before backfilling the excavation. Field fabricated pipe support systems must be designed to have a minimum load safety factor of three (3) times the anticipated loading.

- C. Repair damaged galvanized coated surfaces in accordance with ASTM A780-93. Apply 2-mil thick coating of ethyl silicate in-organic zinc-rich paint primer per manufacturer's directions. Zinc primer must be allowed to completely dry before backfilling the excavation.
- D. Cold-galvanizing zinc primer paint must be of the inorganic, ethyl silicate type, containing at least 60% zinc dust and 40% adhesive binders, and conform to ASTM 780-93, type as manufactured by Tnemec Products, Kansas City, MO., Brite Products, Detroit, Mich., or Valspar Coatings, Minneapolis, MN.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. All ductile iron 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.
- C. The water mains must be laid with depths of cover as indicated under Article 3.12 of this specification, unless otherwise shown on the drawings, or directed by the Commissioner. The pipes must be laid true to line and grade.
- D. Fittings as specified must be used where shown on the drawings and where grade or alignment changes require offsets greater than those recommended by the pipe manufacturer.

### 3.2 TRANSPORTATION, DELIVERY AND STORAGE

- A. Every precaution must be taken to prevent damage to the pipe during transportation and delivery. Pipe ends, fittings, valves and hydrants must be sealed with caps or by another suitable method upon transportation from the supplier. Caps or end seals must be sturdy, secure, and wind- resistant so as to protect the pipe at all times prior to installation. Extreme care must be taken in loading and unloading the pipe and fittings. Such work must be done slowly with skids or suitable power equipment and the pipe must be 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. When handling the pipe with a crane, a suitable pipe hook or rope sling around the pipe must be used. Under no condition may the sling be allowed to pass through the pipe unless adequate measures are taken to prevent damage to the pipe ends and lining.
- 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 store pipe in a manner that will prevent damage. Pipe must be placed on wooden timbers or another suitable support on level ground. The Contractor must prevent the pipe from rolling. The procedures used to prevent rolling must be approved by the Commissioner

### 3.3 PREPARATION FOR LAYING PIPE

- A. Materials, coatings, and linings must be as specified herein, shown on drawings, or directed by the Commissioner. Water mains and services must be installed where shown on the drawings. Installation must be in accordance with standards as recommended by the pipe manufacturer, and as specified herein.
- 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 lying, 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 and/or fitting and replace it with a sound one at his expense and to the satisfaction of the Commissioner.

- 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. Exposed ends of uncompleted lines and existing water mains and services cut and not abandoned must be capped or otherwise temporarily sealed at all times when pipe laying is not in progress.
- E. When cutting ductile iron pipe, it must be neatly cut perpendicular to the longitudinal axis of the pipe without damaging the pipes lining or coating or jointing surface area.

### 3.4 LAYING WATER MAIN PIPE

- A. All pipelines must be laid in trench excavations on bedding or other foundations, as shown on the drawings, specified herein, or ordered by the Commissioner. The pipe must be properly secured against movement and pipe joints must be made in the excavation as required. Pipes must have solid bearing throughout their entire length.
- B. At locations where pipe thrust is anticipated to occur, pipe and fittings must be anchored or restrained as shown on the drawings, specified in Section 33 11 15 – Thrust Restraint, or as directed by the Commissioner. **Polyethylene encasement is to be installed on all new water main pipe and fittings before pipe is installed and braced against movement.** Care must be taken so as not to damage the polyethylene encasement during the installation or blocking of the pipe and fittings. If damage occurs, the Contractor must repair or replace the polyethylene encasement at his expense to the satisfaction of the Commissioner.
- C. Pipe lying will be permitted only in dry trenches having a stable bottom. 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.

- D. 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.
- E. The Contractor must also take such required precautions to prevent flotation of the new pipeline.

### 3.5 ASSEMBLY OF FLANGED JOINTS

- A. Flanged joints must be made with bolts or bolt studs with nuts as specified in Section 2.2 of this specification.
- B. Tighten flange bolts as recommended by the gasket manufacturer to ensure an evenly compressed gasket and leak tight joint.
- C. After the bolts and nuts have been properly installed, tightened, and cleaned, prime them with bitumastic paint.

### 3.6 ASSEMBLY OF MECHANICAL JOINTS

- A. Thoroughly brush the surfaces with which the rubber gasket comes in contact with a wire brush just prior to assembly of the joint. Brush lubricant over the gasket and the plain end just prior to installation. In making up mechanical joints, the spigot must be centered in the bell.
- B. The gasket and gland must be placed in position, the bolts inserted, and the nuts tightened finger tight. The nuts must be tightened by means of a torque wrench in such a manner that the gland must be brought up evenly into the joint.
- C. Joints are to be made up to allow electrical continuity from one pipe to another by installing wedges as specified in Article 2.1, paragraph C of this specification and are to be installed in the following manner:
  - 1. Use two (2) wedges per joint for 3-Inch to 12-Inch diameter pipes. Wedges must be placed on opposite sides of the joint at an equal distance apart (9 and 3 o'clock positions) around the joint.
  - 2. Use four (4) wedges per joint for 16-inch to 24-inch diameter pipes. Wedges must be installed side by side in pairs placed on opposite sides of the joint at an equal distance apart (9 and 3 o'clock positions) around the joint.

3. Use six (6) wedges per joint for pipes larger than 24-inches in diameter only if building services are directly connected to the main. Wedges must be installed side by side in pairs 120 degrees apart at the 12, 4, and 8 o'clock positions around the joint.
- D. The following range of bolt torques must be applied as specified in Table C. If sealing is not obtained at the maximum torque requirements listed in Table C, the joint must be disassembled, thoroughly cleaned, and reassembled.

**TABLE C – BOLT TORQUE REQUIREMENTS**

Bolt Size	Torque Range
5/8-inch	45-60 ft-lbs
¾-inch	75-90 ft-lbs
1-inch	85-100 ft-lbs
1 1/4inches	105-120 ft-lbs

3.7 ASSEMBLY OF PUSH-ON RUBBER GASKET JOINTS

- A. Thoroughly brush the gasket seat in the bell with a wire brush and wipe the gasket and gasket seat with a cloth. Place the gasket in the socket with the large round end entering first so that the groove fits over the bead in the seat. Apply a thin film of NSF 61 approved joint lubricant to the inside surface of the gasket that will come into contact with the entering pipe.
- B. Thoroughly brush the plain end of the pipe with a wire brush and placed it in alignment with the bell of the pipe to which it is to be joined. Make up the joint by exerting sufficient force on the entering pipe so that its plain end is moved past the gasket until it makes contact with the base of the socket.
- C. Joints are to be made up to provide electrical continuity from one pipe to another by installing wedges as specified in Article 2.1, paragraph C of this specification and are to be installed in the following manner:
  1. Use two (2) wedges per joint for 3-Inch to 12-Inch diameter pipes. Wedges must be placed on opposite sides of the joint at an equal distance apart (9 and 3 o'clock positions) around the joint.



2. Use four (4) wedges per joint for 16-Inch to 24-Inch diameter pipes. Wedges must be installed side by side in pairs placed on opposite sides of the joint at an equal distance apart (9 and 3 o'clock positions) around the joint.
3. Use six (6) wedges per joint for pipes larger than 24-Inches in diameter only if building services are directly connected to the main. Wedges must be installed side by side in pairs 120 degrees apart at the 12, 4, and 8 o'clock positions around the joint.

D. Assemble restrained joint pipe in accordance with manufacture's instructions.

### 3.8 TEMPORARY BULKHEADS

- A. At ends of constructed sections where adjoining water mains or structures have not been completed and are not ready to be connected, temporary bulkheads must be used.

### 3.9 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.

### 3.10 ENCASING DUCTILE IRON PIPE IN POLYETHYLENE

- A. All cast and ductile iron pipe and fittings must be encased in polyethylene tubing before being installed, blocked, or braced.

### 3.11 USE OF DAMAGED, DEFECTIVE, OR NON-SPECIFIED CASTINGS AND FITTINGS

- A. All construction castings and pipe fittings that are determined to be damaged, defective or do not meet these specifications and are stored within the Work area must be marked for non-use and removed and replaced with fittings that conform to these Specifications.

### 3.12 DEPTH OF PIPE COVER

- A. Unless otherwise shown on the Plans or directed by the Commissioner, all water mains and services must be installed so a minimum pipe cover is achieved as shown in Table D.

**TABLE D – MINIMUM DEPTH OF COVER FOR WATER MAINS**

Size of Pipe	Depth of Cover
3/4 to 3-inches	5-ft 6-inches <u>±</u> 3-inches
4-inch	5-ft 6-inches <u>±</u> 3-inches
6-inch	5-ft 6-inches <u>±</u> 3-inches
8-inch	5-ft 3-inches <u>±</u> 3-inches
12-inch	5-ft <u>±</u> 2-inches
16-inch	4-ft 6-inches <u>±</u> 2-inches
24-inch	4-ft <u>±</u> 1-inch
30 to 42-inches	3-ft 6-inches (min) or as detailed on drawings
48-inches & Larger	3-ft (min) or as detailed on drawings

3.13 ABANDONMENT OF EXISTING WATER MAINS

- A. All openings on abandoned pipe or conduit are to be sealed with a concrete mortar plug of a minimum of one (1) foot in length within the pipe. Pipe 16-Inches in diameter and larger must be filled with fine graded aggregate or controlled low strength material (CLSM) flowable fill, as appropriate, or directed by the Commissioner. CLSM flowable material must meet standards specified in Section 31 23 10, "Excavation, Trenching and Backfilling", paragraph 2.3, C of these specifications.

3.14 DISINFECTION OF PIPE AND FITTINGS

- A. Protect new and existing pipe and fittings from water, debris and foreign materials as specified in Section 31 23 10 – "Excavation, Trenching and Backfilling".
- B. All new pipe, fittings, and valves must be disinfected in accordance with Section 33 13 00 – "Disinfection and Testing of Water Mains", and the requirements of the Bureau of Water Quality which may be contacted at 312.744.8190.

- C. Swab all pipe and fittings that will not be pressure tested or chlorinated with a chlorine solution during installation. Extra precautions must be taken to prevent debris or ground water from entering the section of water main to be swabbed. Incorporate untested section of water main into the flushing routine when the work is necessitated, or part of, a water main replacement project. When connecting pipes to the existing city water system use normal operating pressure to visually inspect for leaks. If feasible, inspect for leaks prior to backfilling the excavation. Comply with all standards and requirements of the Bureau of Water Quality.

### 3.15 WATER MAIN SUPPORT SYSTEMS

- A. Support and anchor all piping in proper position and alignment with due allowance for expansion and contraction.
- B. The type, location, and arrangement of hangers and supports must be as shown on the drawings, or as directed by the Commissioner. Pipe supports and hardware must be appropriate to meet installation conditions, anticipated loading, and fabricated from corrosion resistant materials described in paragraph 2.7 - Pipe Support and Hangers, of this specification. All support systems whether pre-manufactured or field fabricated must have a minimum load safety factor of three (3) times the anticipated loading. Corrosion protective coatings damaged during installation of the pipe support system must be repaired per the manufactures requirements, or as directed by the Commissioner to maintain corrosion protection.

### 3.16 SEPARATION BETWEEN WATER AND SEWER MAINS

- A. When a water main crosses above a sewer 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 water main crosses below a sewer 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 center line of the water main, and an 18-Inch vertical separation must be maintained. Flexible transition couplings must be used to join the ductile iron pipe to the sewer pipe.

END OF SECTION 33 11 13

**SECTION 33 12 16**  
**WATER MAIN CONTROL VALVES**

**PART 1 - GENERAL**

**PART 1 - GENERAL**

1.1 DESCRIPTION OF WORK

- A. This section includes requirements for the installation of gate valves, resilient wedge valves, and butterfly valves.

1.2 WORK OF THIS SECTION SPECIFIED ELSEWHERE

- A. Section 33 13 00 - Disinfection and Testing of Water Mains.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM), latest edition:
  - 1. ASTM A48 - Gray Iron Castings.
  - 2. ASTM A126 - Gray Iron Castings for Valves, Flanges.
  - 3. ASTM A436 - Austenitic Gray Iron Castings.
  - 4. ASTM A439 - Austenitic Ductile Iron Castings.
  - 5. ASTM B584 - Copper Alloy Sand Castings for General Application.
- B. AWWA C110 - Ductile Iron and Gray Iron Fittings, latest edition.
- C. AWWA C111 - Rubber Gasket Joints for Ductile Iron, latest edition.
- D. AWWA C500 - Metal-seated Gate Valves for Water Supply Service, latest

edition.

- E. AWWA C504 - Rubber Seated Butterfly Valves, latest edition.
- F. AWWA C509 - Resilient Seated Gate Valves, latest edition.
- G. AWWA C550 - Standard for Protective Epoxy Interior Coatings for Valves and Hydrants, latest edition.
- H. Federal Specification FF-B-575C - Bolts; Hex and Square, latest edition.
- I. Federal Specification FF-N-836E - Nut; Square, Hex, Cap, latest edition.

#### 1.4 SUBMITTALS

- A. Contractor must provide an affidavit stating that all Butterfly Valves, valve operators, and torque overload protectors comply with all applicable provisions shown on the drawings and as specified in this specification.
- B. Provide manufactures catalog cuts and/or certified drawings of all valves, valve operators, and torque overload protectors to be furnished. The manufactures catalog cuts and/or certified drawings must provide all necessary information regarding dimensions and materials used and conformance to requirements stated in these specifications.
- C. All submittals must be reviewed and approved by the Commissioner prior to installation.

#### 1.5 QUALITY ASSURANCE

- A. Each valve must be hydrostatically tested at the manufacturer's shops and proven hydraulically tight at all pressures up to 200-pounds per square inch.
- B. For gate valves, the following tests are required:
  - 1. The first test consists of applying a 200-pound per square inch hydrostatic pressure between the discs through an opening in the bonnet casting.
  - 2. The second test consists of applying a 200-pound per square inch hydrostatic pressure against the outside of each disc in the manner prescribed below:
    - a. The valves must be plugged or capped on both ends. The caps or plugs must be drilled and tapped to accept the pressure test piping.

- b. With the pressure test piping in place, open the gates of the valve, the test-piping valve, and remove the plug in the bonnet. Fill the valve with water. When a discharge occurs at the outlet side, close the water supply line and insert the bonnet plug.
- c. Close the gates of the valves, open test-piping valve, and apply a 200-pound per square inch hydrostatic pressure on the inlet side.

- d. Hold test pressure for one (1) minute. During this time no water should discharge from the outlet end of the test piping. If no leak occurs, release pressure, reverse the test piping, and repeat the test procedures for the other gate. If a leak occurs, repair and / or replace the valve as directed by the Commissioner. Repeat the test procedures.
- 3. An affidavit must be furnished from the manufacturer to attest to the fact that each of the valves furnished under this Contract were proven hydrostatically tight in accordance with the specified test procedures.
- C. Valves that do not meet the requirements of this Section will be rejected and removed by the Contractor, and replaced with valves that conform to this Section, within the time period allowed by the Commissioner. Gate valve removal and replacement will be considered incidental to the installation of the valves and no additional payment will be allowed.
- D. **The Work performed for installing valves must be performed by a plumber licensed in the State of Illinois or the City. The Work may include, but not be limited to, setting the valve; cutting and joining all pipe; installing test taps, fittings, adapters, joint gaskets, and continuity wedges; and tightening all gland nuts and bolts, as applicable for the installation.**

**PART 2 - PRODUCTS**

**2.1 GATE VALVES**

- A. All gate valves are to be Chicago Standard Gate Valves of the size shown on the drawings that are designed, manufactured, tested, and inspected in accordance with AWWA C500, and in accordance with the exceptions noted here. All valves are to be delivered fully assembled.
- B. The following characters must be cast in 1/2-inch letters on the bonnet of each valve:
  - Chicago
  - Year of Manufacture
  - Manufacture's Name
- C. Gate valves must be of mechanical joint type double disk and in the following sizes: 4-Inch, 6-Inch, 8-Inch, 12-Inch, and 16-Inch. Larger size valves must be of a butterfly style.
- D. Material used must meet the requirements as to physical and chemical properties, as specified in this Section.

- E. Valves found to contain defects such as blowholes, shrinkage or slag holes, cold shuts, or cracks will be rejected.
- F. The thickness of metal in castings, whose standard thickness is less than 0.8-Inch, must not be more than 0.08-inch less than the standard thickness. The deficiency in thickness of castings, whose standard thickness is 0.8- inch or more, must not exceed 10% of the standard thickness. The above allowable deficiencies in thickness, however, must not extend over more than one-half of the area of the casting.
- G. After being cleaned and tested, every assembled valve and all metallic parts must be coated inside and outside with coal tar pitch varnish. It must produce a smooth and non-tacky coating tough and tenacious when cold and not brittle nor with any tendency to scale off.
- H. The brass castings must comply with ASTM B584, Copper Alloy UNS No. C83600.
- I. The bronze in the valve stem and in the stem nut must be manganese bronze, complying with ASTM B584, Copper Alloy UNS No. C86700. Stem seals are to be double o-rings complying with ASTM D2000 and ASTM 568A
- J. The gaskets used between the flanges must be fully faced, 1/32-inch thick and made of heavy-duty, asbestos-free, fiber composition, suitable for water service.
- K. Bolts and nuts must be made of cast iron or steel. Heads of seal plate bolts must conform to the dimensions shown on the Drawings (an alternate of hex or square head bolt is acceptable) while all other requirements of seal plate bolts must conform to Federal Specification FF-B-575C and nuts must conform to FF-N-836E. Heads of bolts must be unfinished and nuts must be semi-finished. Both bolts and nuts must be hot dipped galvanized as specified in the applicable Federal Specification.
- L. The valves herein specified must be furnished complete with mechanical joint accessories. The mechanical joint accessories must consist of mechanical joint thrust restraint glands, rubber gaskets, and tee head bolts and hex nuts, all conforming to AWWA C110. Dimensions and tolerances for mechanical joints must conform to table 1 of AWWA C110.
- M. It will be the manufacturer's responsibility to provide the patterns and gauges necessary to perform the work to be done hereunder. The Department will not furnish these items.



N. The Department reserves the right to make at any time such tests as it may deem proper to determine that the materials used are proper for the Work and that the valves are of good mechanical construction. The manufacturer must give the authorized inspectors of the Department free access to all places where valves are being made. At the Department's request, the manufacturer must furnish properly prepared standard test specimens of the materials used and must provide facilities for testing them.

O. All valves must open by turning the operating stem clockwise.

P. Operating nuts must be 2 ½-Inches square at the base of the nut.

## 2.2 RESILIENT SEATED WEDGE GATE VALVES

A. The Contractor must furnish and install resilient-seated gate valves that are designed, manufactured, tested, and inspected in accordance with AWWA C509, with following exceptions, deletions, or additions:

1. Exceptions for Section 4.4.7. Valves are to be supplied with 2 ½-inch square operating stem wrench nuts.
2. Exception for Section 4.4.7.2. All valves must open by turning the operating stem clockwise as viewed from top of the valve.

B. Resilient seated wedge gate valves must be of the mechanical joint type supplied complete with joint thrust restraint glands, vulcanized natural or synthetic rubber gaskets, and tee head bolts and hex nuts, all conforming to AWWA C110. Dimensions and tolerances for mechanical joints must conform to Table 1 of AWWA C110.

C. All valves must provide an unobstructed waterway of full size when open. Gates or stems must not extend into the waterway. Valves are to be supplied in sizes between 4 and 12-Inches as noted on the drawings.

1. The bronze in the valve stem and in the stem nut must be manganese bronze, complying with ASTM B584, Copper Alloy UNS No. C86700. Stem seals are to be double o-rings complying with ASTM D2000 and ASTM 568A.
2. After being cleaned and tested, every assembled valve and all metallic parts must be coated inside and outside with coal tar pitch varnish. It must produce a smooth and non-tacky coating tough and tenacious when cold and not brittle nor with any tendency to scale off.

## 2.3 BUTTERFLY VALVES

A. Butterfly valves, as specified here, must be designed, manufactured, tested, and

inspected in accordance with AWWA C504, Class 150Band with the requirements of this Section as listed hereafter:

1. Body Type: Short bodied mechanical joint, as specified.
2. Maximum Non-shock Shut-off Pressure: 100psi.
3. All valves must have flow through discs.
4. Each valve furnished must be subjected to the performance, leakage and hydrostatic tests described in Section 5.2 of AWWA C504.
5. A minimum of two (2) weeks prior to the test dates, the manufacturer must notify the Commissioner in writing when the shop testing of the valve will occur. Failure to notify the Commissioner will not be grounds for rejection.
6. The manufacturer must submit to the Commissioner records of all tests performed under Sections 2.3, 3.8.5, and 5.2 of AWWA C504.
7. Shaft seals must be either split V type packing or "O" ring seals. Shaft seals consisting of a stuffing box with pull down packing are not acceptable.
8. The shaft seal area must not be exposed to the environment. Should the valve design utilize an open packing bonnet area, that area must be enclosed with a 304 series type 18-8 stainless steel, minimum 1/4-Inch thick removable shroud. The shroud must be fully sealed and rated for buried service. An access cover must be provided on the shroud with a minimum opening of 6-Inches x 8-Inches.
9. The valve shaft must be 304 or 316 stainless steel.
10. The valve body must be made of cast iron conforming to ASTM A126, Class B or ASTM A48, Class 40 alloy cast iron ASTM A436, Type 1 and 2 or ASTM A439, type D2 with maximum of 0.003% lead. The valve disc must be ductile iron conforming to ASTM A536, and it must have a seating edge of 304 or 316 stainless steel. The seating edge may be installed in the valve body if the rubber seat is applied to the valve disc. The valve seats for 24-inch and larger butterfly valves must be capable of adjustment or replacement at the installation site.

11. Valve discs must be secured to shafts by means of solid, smooth-sided stainless steel or monel taper pins or dowel pins having a circular cross section. Each taper pin or dowel pin must be extended through the shaft and mechanically secured in place. The use of bolts, setscrews, knurled or fluted dowel pins, flat sided taper pins, expansion pins, roll pins, tension pins, spring pins, or other devices in lieu of the pins specified herein will not be acceptable.
12. The valves and valve operators must be rated for buried service, except electric actuators.
13. Valve operators must conform to AWWA C504 for Class 150B. Manual operators must be Limitorque worm gear, self-locking type designed to hold the valve in any intermediate position without creeping or fluttering. Operators must be equipped with torque overload protection to prevent over travel of the disc in the open and closed position. Spur gear must be furnished with an operator to increase the number of turns and reduce operating torque. A separate limit stop device must also be installed in accordance with "Torque Overload Protection", described below. Operators must provide position indication on the housing of the operator. Valves must open with a clockwise rotation of the nut. The valve and valve operator must be rated for bi-directional flow.
14. Valve operators must be equipped with a Chicago standard style hub nut. The hub nut must be attached to the input shaft of the operator by means of a shear pin. The shear pin must be sized such that it fails when 350 foot-pounds of input torque is applied to the hub nut. Three (3) additional shear pins must be furnished as replacement part for each valve ordered.
15. Corrosion resistant nameplates, as described in Section 6.1 of AWWA C504, must be permanently attached to both the valve and valve operator. There must be two (2) valve nameplates. One must be affixed to the valve body and the other must be affixed to the valve operator in a prominent location. In addition to the normal valve data, the plate must also include the number of turns required to operate the valve and the direction to open (clockwise to open). There must be one (1) operator nameplate affixed to the valve operator. The minimum number of turns to close the valve must be no less than 2 turns per inch (5 turns per centimeter) of valve size in order to minimize water hammer.

16. The manufacturer must provide all nuts, bolts, gaskets, and glands required to make connections.

B. Torque Overload Protection

1. Contractor must furnish torque overload protection devices. The device must be installed on top of the Chicago standard hub nut on butterfly valve operators and in conformance to the following requirements.
2. Purpose: The over torque protector must prevent butterfly valve and operator from damage due to excessive operating torque.
3. Operation: The device must transmit applied torque in either direction only up to a preset amount and automatically disengage if greater torque is applied. It must automatically reset if the applied torque is below the preset amount.
4. Description: The device must be of overall rugged and of durable construction suitable for long-term reliable operation and suitable for buried service.
5. The upper end must have an integral 2 ½-Inch square operating nut and the lower end must have a matching socket. The socket must have one (1) 2-Inch square head set screw in each of two (2) adjacent faces.
6. The operating mechanism must employ spring-loaded tapered rollers engaged in matching tapered detents. A ball bearing type design will not be accepted.
7. The manufacturer's identification must be cast in 3/8-inch or larger letters on an upper surface.
8. Corrosion Protection and Lubrication: The entire housing must be coated inside and outside with two-part epoxy. The outside must have a topcoat of two-part polyurethane similar in color to U.S. Paint #G9337 "Sun Yellow".
9. The operating mechanism must be permanently lubricated and sealed to withstand 50-feet of water head.
10. There must be no water-retaining external cavities.
11. Service Life: The device must have a minimum life of one-thousand (1000) trips from rated capacity.
12. Trip Torque Set Point: The device must be factory set to trip at 200 foot-pounds of applied torque.

13. Trip Torque Adjustment: Trip torque must be adjustable from 10% to 100% of rated capacity without disassembling the unit. The adjustment means must be sealed and concealed to prevent tampering.

#### 2.4 QUARTER TURN AWWA ELECTRIC VALVE ACTUATORS (OPEN-CLOSE SERVICE)

- A. When shown on the Plans, specified, or as directed by the Commissioner, the Contractor must furnish electric valve actuators in conformance with the following requirements.
  1. The electric valve actuator must include the motor, actuator unit gearing, position limit switches, torque switches, declutch lever, and hand wheel, as self-contained unit. The actuator must meet the latest revision of the applicable AWWA specification. The actuator must be of sufficient capacity to operate the attached butterfly valve in a modulating action against 100-pounds per square inch pressure.
  2. The motor must be rated for continuous duty, specifically designed for valve actuator service, and must be of high starting torque, totally enclosed, non-ventilated construction. Motor insulation must be a minimum NEMA Class F, with a maximum continuous temperature rating of 311° Fahrenheit (rise plus ambient) for the duty cycle specified. Provide optional insulation classes where specified or where service conditions warrant.
  3. The motor must be of sufficient size to open or close the valve at the maximum torque. The motor must be capable of operating at plus or minus 10% of specified voltage. The motor duty rating must be sufficient for one (1) complete cycle (open-close-open, or reverse) without exceeding its temperature rating. Motor bearings must be of the anti-friction type, and permanently lubricated.
  4. The motor must be an independent sub-assembly such that the power gearing must not be an integral part of the motor assembly, to allow for motor or gear changes dictated by system operation changes. The motor must be equipped with internal thermal contact, to protect against motor overload, and 120-volt heaters. The motor must be designed to operate on 230/460 VAC.
  5. The actuator must be a multiple reduction unit with power gearing consisting of spur or helical and worm gearing. There must be a self-locking worm gear set in the drive train to maintain valve position. The spur or helical gearing and worm gear must be of hardened alloy steel, and the worm gear must be alloy bronze. All power gearing must be

accurately cut; non-metallic, aluminum, or cast gearing must not be allowed. Anti-friction bearings with caged balls or rollers must be used throughout.

6. All rotating power train components must be immersed in grease with provisions for inspection and re-lubrication without disassembly. Lubricants must be suitable for ambient conditions between 20° F and 150° F. Adequate seals must be provided on all shafting.
7. The actuator must have a built-in device, which allows the motor to reach full speed before engaging the valve load when required by unseating applications.
8. A metallic hand wheel must be provided for manual operation, with an arrow to indicate "open" rotation. The hand wheel must not rotate during motor operation. A fused motor must not prevent manual operation. When in manual operating mode, the actuator must remain in this mode until the motor is energized, at which time the actuator will automatically return to electric operation. Changing from motor operation to manual operation must be accomplished by a positive, padlockable declutching lever, which mechanically disengages the motor and related gearing. It must be impossible for simultaneous manual and motor operation to occur. Friction type declutching mechanisms are not acceptable.
9. Position limit switches and associated gearing must be an integral part of the valve actuator. Limit switch gearing must be of the intermittent type, made of bronze or stainless steel, lubricated, and totally enclosed to prevent dirt and foreign matter from entering the gear train. Limit switch contacts must be heavy duty and silver-plated with wiping action. Where specified, the actuator must have sixteen (16) contacts, four (4) contact/four (4) rotor types, all of the same basic design. As an alternative, a limit switch assembly may be directly coupled to the valve stem, eliminating the need for intermittent gearing, and eight (8) single pole, double throw (SPDT) or eight (8) double pole, double throw, (DPDT) contacts. Contacts must be convertible from normally open, to normally closed, or reverse.
10. Switches must be adjustable, allowing for trip points from fully open to fully closed positions of valve travel. They must not be subject to breakage or slippage due to over-travel.
11. Switch design must permit visible verification of switch position without disassembly.
12. Each valve actuator must be equipped with a switch that will

interrupt the control circuit in both the opening and closing directions when valve torque overload occurs. Contacts must be silver-plated. The torque switch must have graduated dials for both open and close directions of travel, and each must be independently adjustable. The torque switch must include a positive means to limit adjustability so as not to exceed the actuator output torque capability. The activating spring back must be of the Belleville spring design.

13. The position limit switch and torque switch contact must be rated 600 volts per NEMA standard ICS 2-125, heavy duty.
14. The control compartment must be provided with a 120-volt space heater.
15. The valve and operator must be aligned in such a manner that when installed, the manual hand wheel is in a horizontal plane.
16. The operating time must be two (2) minutes for 90 °- valve travels.

### **PART 3 - EXECUTION**

#### **3.1 FIELD TESTING**

- A. All valves will be tested as specified in Section 33 13 00 - Disinfection and Testing of Water Mains.

#### **3.2 SETTING OF VALVES**

- A. Valves must be carefully installed in their proper positions, free from all distortion and strain, with mechanical or flanged joints, and must be packed and left in satisfactory operating condition.

#### **3.3 SETTING OF VALVE BOXES**

- A. Valve boxes must be installed where shown on the drawings, or where ordered by the Commissioner, and must be set vertical and concentric with the valve box. Any valve box which has been moved from its original position by direct or indirect actions of the Contractor, so as to prevent the operation of the valve key extension, must be reset and/or replaced as applicable, by the Contractor. This work will be considered incidental to the construction and not considered for additional payment. Any valve key extension or stem, which has been damaged so that it is inoperable, must also be replaced, and will also be considered incidental to the construction and no additional payment will be allowed.

END OF SECTION 33 12 16

## **SECTION 33 12 19**

### **FIRE HYDRANTS**

#### **PART 1 – GENERAL**

##### **1.1 DESCRIPTION OF WORK**

- A. This section includes requirements for supplying materials for and the installation of fire hydrants, as shown on the drawings and specified here.

##### **1.2 REFERENCES**

- A. American Society for Testing and Materials (ASTM), latest edition:
  1. ASTM A108 - Standard Quality Carbon Steel Bars.
  2. ASTM A126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
  3. ASTM A153 - Hot Dip Zinc Coating for Iron and Steel Hardware.
  4. ASTM A307 - Carbon Steel Bolts and Studs.
  5. ASTM A536 - Ductile Iron Castings.
  6. ASTM B62 - Composition Bronze or Ounce Metal Castings.
  7. ASTM B584 - Copper Alloy Sand Castings.
  8. ASTM B633 - Electrodeposited Zinc Coatings on Iron and Steel.
  9. ASTM C700 - Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.
  10. ASTM D395 - Test Methods for Rubber Property Compression Set.
  11. ASTM D412 - Test Methods for Rubber and Elastomers.
  12. ASTM D2000 - Classification of Rubber Products in Automotive Applications.
  13. ASTM D2240 - Durometer Test for Rubber Hardness.
- B. AWWA C502 - Dry Barrel Fire Hydrants, latest edition.
- C. Federal Specification FF-B-575C - Bolts; Hexagon and Square, latest edition.
- D. Federal Specification RR-C 271D - Chains and Attachments, latest edition.

##### **1.3 SUBMITTALS**

- A. Provide an affidavit from the manufacturer to attest to the fact that all hydrants furnished under this Contract were tested and proven hydrostatically tight and mechanically sound in accordance with the specified test procedures.



#### 1.4 QUALITY ASSURANCE

- A. After each hydrant is completely assembled, it must be mechanically and hydrostatically tested in conformance with AWWA C502, Sec 5.1.
- B. The Work performed for the hydrant installation must be performed by a plumber licensed in the State of Illinois or the City. The Work may include, but not be limited to, setting hydrants; joining all pipe, fittings, and valves; installation of joint gaskets and continuity wedges; and tightening of all gland nuts and bolts, as applicable for the installation.

### **PART 2 - PRODUCTS**

#### 2.1 GENERAL

- A. The hydrants must be of the City of Chicago standard design with mechanical joint bottom. The completed hydrants must be delivered finished, painted, and fully assembled.

#### 2.2 FIRE HYDRANTS

- A. The standpipe must include the manufacturer's name, year of manufacturing, and the letters "C.W.W." in letters 1-Inch high. This lettering must be positioned approximately 1 foot below the top flange.
- B. Materials from which the various parts of the hydrants are constructed must be of the kind designated on the details. Each kind of material used must meet the requirements as to physical and chemical properties hereafter specified. Test bars required to established quality grade or strength under the ASTM standards must be made and machined by the manufacturer as part of the work.
- C. 3/4-Inch x 2-3/4-Inch unfinished hex head machine bolts and 3/4-Inch American Standard regular hot press hex nuts must conform to Federal Specification FF-B-575C, Class B Steel, Class 1 fit or, hex head bolts and hex nuts must conform to ASTM A307 Grade A. All nuts and bolts to be hot dipped galvanized conforming to ASTM A153 or must be coated by the rust proof electrozinc process ASTM B633, Type G.S., or SS Type 18-8SS, ANSI Type 302, 303, or 304.

- D. Iron castings must conform to ASTM A126 Class B. The thickness of metal castings, whose standard thickness is less than 0.8-Inch, must not be more than 0.08-Inch less than the standard thickness. The deficiency in thickness of castings, whose standard thickness is 0.8-Inch or more, must not exceed 10% of the standard thickness. The above allowable deficiencies in thickness must not extend over more than one-half of the area of any casting. The diameter of the castings must not vary from the standard dimensions by more than 0.08-Inch.
- E. All bronze castings, with the exception of the stem nut, stem screw, and valve seats must conform to ASTM B62 for Leaded Red Brass Copper Alloy UNS No. C83600. The valve seat must conform to ASTM B584 for Leaded Manganese Bronze, Copper Alloy UNS No. C86700. The stem nut and stem screw must conform to ASTM B584 for Silicon Brass, Copper Alloy UNS No. C87600 with the following mechanical properties:
  - 1. Minimum Tensile Strength - 45,000-psi
  - 2. Minimum Yield Strength - 25,000 psi
  - 3. Minimum Elongation - 16% of length
  - 4. Brinell Hardness - 110
- F. The stem nut and stem screw must be stamped SI for identification purposes.
- G. Wrench nuts made of ductile iron must be marked "D.I." on the flange portion opposite the arrow indicating the direction of turn to open.
- H. Ductile iron castings must comply with compositions and physical properties in accordance with ASTM A536 Grade 65-45-12.
- I. The City will furnish neoprene-seating valves if requested by the Contractor. The Contractor's charges for transporting the neoprene seating valves must be considered incidental to the construction and no additional payment will be allowed.
- J. Full face gasket of suitable material, 1/16-inch thick, 8 1/2-inches X 13 1/2-inches, with eight (8) 7/8-inch diameter holes on an 11 3/4-inch bolt circle must be provided for the hydrant flange gaskets.
- K. Steel hydrant chain must comply with Federal Specification RR-C-271D (1), Type II, Class 2, with an approximate weight of 25-pounds per 100 feet, and have a hot galvanized coating. This chain, approximately 26-Inches long, must be connected to hydrant cap hooks and fastened at its center to the hydrant by means of the 1/2-Inch X 1-Inch cap screw with chain angle and "S" hook of 1/2-Inch mild steel stock "S" hook and cap hooks which engage the chain, must be

securely welded in the closed position or fastened in a suitable manner to hold the hooks securely in a closed position.

- L. Where the Plans call for finish and drilling, all such work must accurately comply with the dimensions shown, so that all parts are interchangeable from one hydrant to another. It will be the manufacturer's responsibility to provide the patterns and gauges necessary to perform the work specified.
- M. Where machining tolerances are not indicated on the drawings, the following must be used where applicable:
  - 1. If dimension is in decimals, tolerance is  $\pm 0.005$ -Inch.
  - 2. If dimension is in inches, tolerance is  $\pm 1/64$ -Inch.
- N. Appropriate lubricant must be applied to threads on hydrant bottom, 1/2-Inch X 1-Inch cap screw and valve seat before assembly.
- O. Operating stem must be of cold rolled steel, ASTM A108 Grade 1018. Stem must be coated, excluding bottom 3-7/8-Inch of the section below shoulder including threads, with a bituminous coating.
- P. Rubber Gaskets must comply with ASTM D2000; Type SC-715B, as follows:
  - 1. Shore A Durometer Hardness -  $70 + 5$  ASTM D2240.
  - 2. Tensile Strength - 1500-psi minimum ASTM D412.
  - 3. Compression Set - 35% maximum ASTM D395.
- Q. The City reserves the right to make at any time such tests as it may deem proper to determine that the materials used are proper for the work and that the hydrants are of good mechanical construction. The contractor must give the authorized inspectors of the City free access to all places where hydrants are being made. At the City's request the manufacturer must furnish properly prepared standard test specimens of the materials used and must provide facilities for testing them.
- R. Fire Hydrants that do not meet the requirements of this Specification will be rejected and, when so ordered by the City, the Contractor must remove all inferior hydrants not meeting the Specification and replace rejected items within the time limits as specified. The removal and replacement of the hydrants will be considered incidental to the construction and no additional payment will be allowed.

## 2.3 PAINT

- A. All ferrous metal parts of the hydrant, inside and outside, must be thoroughly cleaned before coating. Coatings used on interior surfaces of

the hydrant that are in contact with potable water must be suitable for contact with drinking water. Prepare hydrant surfaces and apply paint in accordance with paint manufacturer's recommendations. Do not paint exposed hydrant nozzle threads or other useable threads.

- B. Primer must be red oxide primer; acceptable products are W. C. Richards Metal primer #WRFA-13-127; or Benjamin Moore Universal Metal Primer # M07.
- C. Top coat must be alkyd high-gloss enamel; acceptable produces are Benjamin Moore Impervo #C13320 (Brilliant Red), or Sherwin Williams Industrial Enamel Safety Red #617-4064.
- D. Paint for color coding flange must be as follows:
  - 1. White colored pigment; acceptable products are Seymour Stripe #16-652 Spray (White), Rustoleum High Performance Acrylic 5200 System (#5292 Gloss White), or Sherwin Williams PM 200 AES Pure White #5178-99993.
  - 2. Yellow colored pigment; acceptable products are Benjamin Moore Impervo #C133 Alkyd High-Gloss Metal and Wood Enamel (Safety Yellow), or Sherwin Williams Industrial Enamel Safety Yellow #617-4072, #617-8000, or #617-50320.
  - 3. Blue colored pigment: accept products are Seymour Stripe #16-653 Spray (Precaution Blue), or Rustoleum High Performance Acrylic 5200 System (#5225 Safety Blue), or equal.
- E. Shop Coating of Fire Hydrants.
  - 1. Exterior ferrous surfaces of the hydrant must be painted with a coat of primer to two feet below the top flange.
  - 2. Exterior ferrous surfaces of the hydrant must be given a topcoat of alkyd high-gloss enamel to two feet below the top flange.
  - 3. All exterior ferrous surfaces below the ground line not coated with primer and topcoat must be shop coated with two (2) coats of asphaltic coating, each a minimum of 1 mil thick. The first coat must be allowed to dry thoroughly before applying the second coat.

#### 2.4 HYDRANT DRAIN

- A. Hydrant drains must be constructed of 6-Inch diameter, extra strength, perforated clay pipe, conforming to ASTM C700, with mortared bell and spigot type joints.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Install fire hydrants and hydrant drain with drainage bedding, and connect to hydrant drain outlet as detailed on the drawings.
- B. Securely connect fire hydrant to the water main using mechanical joint thrust restraint glands or other restrained joint fittings as shown on the drawings.
- C. Pressure test the fire hydrant installation with full line pressure to the fire hydrant without blocking behind the fire hydrant.
- D. Hydrant leads must be 8-Inches in diameter, or as otherwise specified or shown on the Plans.
- E. Spool pieces are not allowed for the vertical adjustment of hydrants. If a vertical adjustment is required due to the depth of the water main, an offset must be utilized prior to installing the hydrant.

### **3.2 COLOR CODING HYDRANT FLANGES**

- A. Contractor must color code the vertical edge of the hydrants top flange, (located approximately 6-Inches from the centerline of the nozzle cap), on all installed hydrants in accordance with the Department's "Color Code for Fire Hydrants".

END OF SECTION 33 12 19

## **SECTION 33 12 20**

### **WATER MAIN VALVE BASINS & METER VAULTS**

#### **PART 1 – GENERAL**

##### **1.1 DESCRIPTION OF WORK**

- A. This Section includes requirements for construction and/or adjustment of water main valve basins and meter vaults using precast concrete or masonry structures.

##### **1.2 WORK OF THIS SECTION SPECIFIED ELSEWHERE**

- A. Section 31 23 10 - Excavation, Trenching and Backfilling.
- B. Section 03 20 00 – Concrete Reinforcing.
- C. Section 03 30 00 – Cast-In-Place Concrete.

##### **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 Precast Concrete Utility Structures

12. ASTM C858 - Standard Specification 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 H2O traffic loading.

### **PART 2 - PRODUCTS**

#### 2.1 PRECAST CONCRETE STRUCTURES

- A. Fabrication standards - Circular precast concrete base and riser sections furnished for manholes, valve basins and other structures must conform to ASTM C478. Non-circular precast concrete monolithic and sectional structures for meter vaults, riser manholes and other structures must conform to ASTM C858.
- 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 in conformance with ASTM C478.
- B. Mating Faces:
  - 1. Smooth
  - 2. Parallel
  - 3. Free from cracks, chips, spalls or casting irregularities interfering with watertight mating to structure top or casting.
  - 4. Provide grooves in faces to contain extrudible preformed gasket material when possible.

## 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. Steps are to be polypropylene plastic encased Grade 60 steel reinforcement conforming to ASTM C478.



## 2.6 CAST-IN-PLACE CONCRETE

- A. Concrete in accordance with Section 03 30 00 – Cast-In-Place Concrete.
- B. Concrete reinforcing in accordance with Section 03 20 00 – Concrete Reinforcing.

## 2.7 CONCRETE AND MASONRY BLOCKS AND BRICKS

- A. Precast concrete brick must conform to ASTM C55 quality designated Grade N-1.
- B. Clay brick must be best quality sewer brick conforming to the qualifications of 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 in accordance with Section 03 30 00 – Cast-In-Place Concrete.

## 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° Farenheit 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. Lay brick courses to the line, straight and parallel, breaking joints with those in adjacent courses.
- C. Lay brick radially as headers in a full bed of mortar with joints not exceeding 3/8-Inch in thickness.
- D. Fill joints with mortar. Interior joints must be trowel-struck.
- E. Fresh masonry must be plastered inside and outside and must be protected from damage of all kinds.
- F. New work, unless immediately covered with earth or brick backing, or an approved form of curing compound, must be kept moist until the mortar has hardened.
- G. Install manhole frame and cover.

### 3.4 FINAL ADJUSTMENT OF STRUCTURES

- A. 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.
- B. Remove the binder and base course adjacent to and for a distance not exceeding 12-Inches outside the base of the castings.
- C. Adjust the castings to final pavement elevation with adjusting rings set in mortar.
- D. Fill the space around the casting with Class SI concrete to the elevation of the surface of the binder course.

3.5 ABANDONMENT OF VALVE BASINS AND OTHER STRUCTURES.

- A. Valve basins and other structures being abandoned, the Contractor must remove the existing frame and lid and return it the City as requested by the Commissioner. The remaining parts of the structure are to be remove to a depth of 36-inch below grade and filled with fine graded aggregate or controlled low strength material (CLSM) flowable fill, as appropriate, or directed by the Commissioner. CLSM flowable material must meet standards specified in Section 31 23 10, "Excavation, Trenching and Backfilling", paragraph 2.3, C of these specifications.

END OF SECTION 33 12 20

**APPENDIX C – CHICAGO TRANSIT AUTHORITY CTA CANOPY SPECIFICATIONS**

The scopes of work, method of measurement and basis of payment for the canopy are included in the main sections of the Special Provisions. The following CTA standard specifications are specifically utilized for the canopy related items.

**INDEX**

<b>SPECIFICATION NUMBER</b>	<b>DESCRIPTION</b>
DIVISION 5	METALS
05 10 30	Structural Steel
05 50 00	Metal Fabrications
DIVISION 7	MOISTURE AND THERMAL PROTECTION
07 60 00	Flashing and Sheet Metal
07 90 00	Joint Sealers
DIVISION 8	WINDOWS AND DOORS
08 90 00	Translucent Canopy Roof
DIVISION 9	FINISHES
09 96 00	High Performance Coatings
DIVISION 11	EQUIPMENT
11 24 24	Access Support and Fall Restraint Equipment
DIVISION 22	PLUMBING
22 40 00	Plumbing
DIVISION 23	HEATING VENTILATING AND AIR CONDITONING
23 83 30	Electric Heat Tracing System
DIVISION 26	ELECTRICAL
26 50 10	Lighting Fixtures

The following CTA standard specifications are for reference only.

<b>SPECIFICATION NUMBER</b>	<b>DESCRIPTION</b>
26 01 00	General Electric Provisions
26 05 00	Raceways and Boxes
26 10 00	Basic Electrical Materials and Methods
26 12 30	Wires, Cables, Splices Terminations
26 14 10	Wiring Devices
26 17 00	Local Control
26 17 50	Local Control Panels
26 19 50	Identification
26 95 00	Electrical Testing

SECTION 05 10 30  
STRUCTURAL STEEL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and Division 1 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, 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 shall be galvanized. New structural steel exposed after installation shall also be coated with protective and finish coats in the field.

1.03 STANDARDS

- A. The structural steel work required herein, except as otherwise shown, shall comply with the provisions of the following codes, specifications and standards:
- B. "Code of Standard Practice of Steel Buildings and Bridges", AISC.
- C. "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings", AISC.
- D. "Structural Welding Code", AWS D1.1.
- E. "Specifications for Assembly of Structural Joints Using High Strength Steel Bolts" as approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
- F. "Handbook on Bolt, Nut and Rivet Standards", Industrial Fasteners Institute.

#### 1.04 QUALITY ASSURANCE

- A. The Contractor is solely responsible for quality control of all the structural steel work. The Contractor shall employ, at his own expense, a qualified independent testing laboratory to conduct specified Source Quality Control and Field Quality Control and provide reports to the Authority. Information regarding the testing agency shall be submitted to the Authority for approval prior to being hired by the Contractor.
- B. Contractor shall comply with all applicable governmental codes and regulations.
- C. Structural Welding Qualification: Weld Procedures and Welding Operators shall be qualified in accordance with ANSI/AWS D1.1, using the same type of equipment and welds to be used in the work.
  - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- 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.

#### 1.05 TESTING

- A. The testing agency to inspect all bolted connections and welds as well as perform all other required tests.
- B. The Contractor shall employ AISC Category III Fabricator's Testing Laboratory, in addition to the requirements of the Contractor's Quality Control Plan. Reports and test results shall be supplied for the inspections and tests listed in this specification.
- C. Bolted connections shall be inspected by the Testing Agency in accordance with AISC Specifications for "Structural Joints Using ASTM A 325 or A 490 Bolts".
- D. Welding will be inspected and tested by the Testing Agency during fabrication and erection of structural steel as follows:



1. Certify all welders and make inspections and tests as required. Record types and locations of all defects found in the work, and measures required and performed to correct such defects.
  2. In addition to visual inspection of all welds, magnetic particle, ultra-sonic and radio-graphic inspection shall be made of all welds. Magnetic particle inspection shall be made on the root pass and finished weld.
  3. The method of magnetic particle inspection shall be in accordance with ASTM E-709. Any type of crack or zone of incomplete fusion or penetration will not be acceptable.
  4. Radio-graphic inspection technique and standards of acceptance shall be in accordance with AWS D1.1.
  5. Ultra-sonic inspection shall be performed in accordance with AWS D1.1.
- E. Each bolting crew and welder shall be assigned an identifying symbol or mark and all shop and field connections shall be so identified that the inspector can refer back to the crew or person making the connection.
- F. Access to locations where material for this contract is being fabricated or produced shall be provided for the purpose of inspection and testing, including scaffolding.
- G. 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.
- H. The Testing Agency shall perform the specified tests. Corrective measures, including additional and more complete testing, which may result from these tests shall be the Contractor's responsibility; all costs of which shall be paid for by the Contractor.
- I. Approved shop drawings are to be submitted to the galvanizer for his review and approval.

1.06 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 to indicate actual field-verified dimensions, elevations and details for all structural steel for this project. Shop drawings to be prepared and certified by a structural engineer licensed in the State of Illinois. Shop drawings to identify the size, location and erection details of all structural steel, connections, and all other details.
- B. Structural Calculations: Prior to fabrication of steel, furnish structural calculations with connection detail drawings for all structural steel and connections for the actual loading and conditions. Calculations shall be prepared by and sealed by the licensed structural engineer.
- 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: If applicable, submit to the Authority, copies of certified survey(s) by the Contractor's registered professional engineer, showing elevations and locations of base plates and anchor bolts to receive structural steel, and showing final elevations and locations for all major members.
- E. Mill Affidavits and Certifications: Prior to fabrication of Structural Steel, the Contractor shall 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.
- F. Submit weld procedures and qualifications for approval prior to fabrication.
- G. Provide certification from the galvanizer indicating that he has reviewed the approved shop drawings and certifies that he is capable of hot dip galvanizing all members and fabrications according to all requirements.

1.07 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 shall be planned so as to avoid delay or damage to the work of other trades.
- B. Storage of fabricated steel at the job site shall be the responsibility of the Contractor. Material stored at the job site shall not exceed design loads on existing or newly-constructed structures so that members will not be distorted or otherwise damaged; and shall be protected against corrosion or deterioration.

PART 2 PRODUCTS

2.01 STRUCTURAL STEEL

- A. Structural steel including beams, columns, angles, channels, plates, etc. shall comply with the provisions of the ASTM specifications for A 36 material unless noted otherwise on the Drawings.
- B. Structural steel tubes shall comply with ASTM A 500 Grade B.
- C. 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. Welding electrodes shall 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 shall be E70XX unless required otherwise.

2.03 BOLTS

- A. All high strength bolts, nuts and washers shall comply with the provision of ASTM A 325.
- B. All anchor bolts, nuts and washers shall conform to the requirements of ASTM F 1554, GR 36.

## 2.04 GALVANIZING, SHOP PRIMING AND FINISHING

- A. All new structural steel members and fabrications to be hot dip galvanized. Galvanized steel exposed to view after installation shall also be finished with protective and finish coats in the field. See painting section of these specifications.
- B. Existing structural steel members and fabrications will be prepared and field finished with protective and finish coats according to painting section of these specifications.

## 2.05 MISCELLANEOUS MATERIAL

- A. Miscellaneous material, accessories, grout, etc. not listed above shall 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.

## PART 3 EXECUTION

### 3.01 FABRICATION

- A. Material shall be properly marked and match-marked where field assembly is required. The sequence of shipments shall be such as to expedite erection and minimize the field handling of material.
- B. Fabricate and assemble structural steel in shop to greatest extent possible. Assemblies shall conform to the dimensions shown on the approved shop drawings.
- C. Beams shall be cambered where indicated on the Drawings.
- D. Beam connections shall be as shown or noted on the Drawings. Unless noted otherwise, standard connections shall be used.
- E. No combination of bolts and welds shall be used for stress transmission in the same face of any connection.

F. 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. 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. Weld threaded nuts to framing and other specialty items as indicated to receive other work.

### 3.02 WELDING

A. Welding, filler metal, welding techniques and procedures shall be in accordance with AISC specification for the "Design, Fabrication and Erection of Structural Steel for Buildings", and AWS "Structural Welding Code" and "Filler Metal Specifications".

B. 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.

C. Built-up sections assembled by welding shall be free of warpage and all axes shall have true alignment.

D. Welds not specified shall be continuous fillet welds, using not less than the minimum fillet as specified by AWS.

E. All welding sequences shall 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.

F. The toughness and notch sensitivity of the steel shall be considered in the formation of all welding procedures to prevent brittle and premature fracture during fabrication and erection.

G. Welded connections shall be detailed and designed to minimize the accumulation and concentration of thru-thickness strains due to weld shrinkage.

### 3.03 PREPARATION OF STEEL

A. Perform all inspections prior to galvanizing or field finishing. For contact surfaces, roughen galvanized surfaces by means of hand wire brushing per ASTM A123. Power wire brushing is not permitted.

- B. All non-galvanized existing structural steel surfaces shall be prepared and cleaned as specified in the painting section of these specifications.
- C. Paint application shall be in accordance with paint manufacturer's printed instructions and recommendations. The fabricator shall submit paint system to be used for approval by the Authority prior to purchasing. All paint products shall be compatible products from the same manufacturer.

#### 3.04 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 A 123 or A 153. All structural steel members shall have all pieces attached by welding to the greatest extent possible as shown on drawings before galvanizing. All bolted pieces shall be bolted together after galvanizing. Ream all holes as necessary prior to galvanizing.
- B. Prior to galvanizing, structural steel shall 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, shall be dipped in 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. Oversize components, threads or otherwise allow for additional thickness of galvanizing.
- 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.

### 3.05 GALVANIZING COATING REQUIREMENTS

- A. Coating Weight: Conform with paragraph 5.1 of ASTM A 123, Table 1 of A 767, or Table 1 of ASTM A 153, as applicable.
- 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.

### 3.06 TESTS FOR GALVANIZING

- A. Galvanizer shall inspect the entire galvanized surface to ensure compliance with ASTM requirements.
- B. Inspection and testing of hot dip galvanized coatings shall be done under the guidelines provided in the AGA publication "Inspection of Products Hot Dip Galvanized After Fabrication".
- C. Include visual examination and tests in accordance with ASTM A 123, A 767 or A 153 as applicable to determine the thickness of the zinc coating on the metal surfaces.
- D. 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.

### 3.09 PAINTING

- A. See painting section of these specifications.
- B. Perform all inspections prior to finishing.
- C. Galvanized steel is to be prepared per ASTM D6386 for painting.
- 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.

### 3.10 BENCH MARKS

- A. The Contractor shall employ the services of a registered professional engineer who shall establish permanent bench marks, field check all elevations, of concrete on which structural steel is to be placed and locations of anchor bolts, reporting any discrepancies to the Authority before the work proceeds.

### 3.11 ERECTION

- A. The Contractor shall be responsible for the accurate setting and leveling of all bearing plates or setting plates. Bearing plates or setting plates shall 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.

### 3.12 ERECTION TOLERANCE

- A. The Contractor alone shall 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 shall be the responsibility of the Contractor.
- B. Unless otherwise noted, individual members of the structure shall 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 shall be accurate to 1 to 1,000 but not to exceed 1/2" for their full height. All leveling and plumbing shall be done based on the mean operating temperature of the structure. Allowances shall 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.

### 3.13 CONNECTIONS

- A. Connections between members and corners shall be mitered unless approved otherwise.
- B. No welding or bolting shall be done until as much of the structure as will be stiffened by the welding or bolting has been properly aligned.
- C. Drift pins shall not be used to enlarge unfair holes in main material. Holes that must be enlarged to admit bolts shall be reamed. Burning and drifting may be used to align unfair holes in secondary bracing members only, when acceptable to the Authority.



- D. When high strength bolts or high strength bearing bolts are used, the AISC specifications shall apply including values as noted therein, and installation by either "turn of nut tightening" or with torque wrenches. In using manual torque wrenches, the required torque can be read from the wrench dial. Care should be taken that the wrench is properly calibrated. Nuts shall be in motion when torque is measured. In using power wrenches, follow the recommendations of the wrench manufacturer.

### 3.14 FIELD ALTERATIONS

- A. Modifications required to structural steel fabrications to facilitate proper installation including cutting, drilling or welding shall be submitted to the Authority for written approval. Provide shop drawings of the proposed modifications certified by a licensed structural engineer.
- B. Repair and touch up galvanizing upon completion of alterations, bolting, welding, etc. of fabrications of existing steel as specified in the painting section.

### 3.15 SOURCE QUALITY CONTROL

- A. Connection Inspection: Perform 100% visual inspection of bolted and welded connections. Examine the surfaces, size, quality and placement of each connection to verify installation in accordance with Contract documents and approved shop drawings. Measure weld length and profile for 15% of welds, selected at random.
- B. Testing of High-Strength Bolted Connections: Test with calibrated torque wrench on at least 25% of the bolts in each bolted connection, but not less than 2 bolts.
- C. Magnetic Particle Testing of Welds: Test in accordance with ASTM E 709 and include not less than the following items:
  - 1. 20% of continuity plate, end plate, and bracing gusset plate fillet welds, selected at random, final pass only.
  - 2. 100% of tension member fillet welds, e. g. hanger rod connections and other similar connections, root and final passes.
  - 3. 100% of partial penetration welds, e.g. built-up members and other similar members, root and final passes.
  - 4. 100% of built-up member fillet welds in zones of moment connections, root and final passes.
  - 5. 20% of other built-up member fillet welds, selected at random, final pass only.
  - 6. 10% of other miscellaneous fillet welds, selected at random, final pass only.

3.16 FIELD CLEANING AND PAINTING

- A. Field cleaning and painting shall conform to the requirements of the painting section of these specifications, including preparation of existing surfaces, preparation of galvanized surfaces, touch-up of galvanizing and application of prime and finish coats at field welds, bolted connections, abraded areas and other areas of the exposed steel.

END OF SECTION 05 10 30

SECTION 05 50 00  
METAL FABRICATIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This section includes but is not limited to the following metal fabrications:
  - 1. Miscellaneous steel angles and shapes.
  - 2. Fence wire mesh
  - 3. Fence screening.

1.3 RELATED WORK

- A. Section 05 10 30, Structural Steel

1.4 REFERENCES

- A. Illinois Department of Transportation (IDOT): "Standard Specifications for Road and Bridge Construction".
- B. American Galvanizers Association(AGA) - Recommended Details For Galvanized Structures.
  - 1. Inspection of Products Hot Dip Galvanized After Fabrication
  - 2. The Design of Products to be hot Dip Galvanized After Fabricaiton
  - 3. Recommenced Details of Galvanized Structures.
- C. ANSI A14.3 – Safety Requirements for Fixed Ladders.
- D. ANSI B18.2.1 - Square and Hex Bolts and Screws - Inch Series
- E. ANSI B18.6.3 - Machine Screws and Machine Screw Nuts.
- F. ANSI B18.22.1 - Plain Washers.
- G. ANSI B18.21.1 – Lock Washers (Inch Series).
- H. ANSI/NAAMM - MBG 532, Heavy Duty Metal Bar Grating Manual
- I. ASTM A27/A27M – Standard Specification for Steel Castings, Carbon, for

General Application.

- J. ASTM A36/A36M - Specification for Carbon Structural Steel.
- K. ASTM A47 – Standard Specification for Ferritic Malleable Iron Castings.
- L. ASTM A48 – Standard Specification for Gray Iron Castings.
- M. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- N. ASTM A143 - Safeguarding Against Embrittlement Of Hot Dipped Galvanized Structural Steel Products And Procedures For Detecting Embrittlement.
- O. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- P. ASTM A167 – Standard Specification for Stainless and Heat-Resisting Chromium- Nickel Steel Plate, Sheet, and Strip.
- Q. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes.
- R. ASTM A312/A312M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes.
- S. ASTM A384 - Safeguard Against Warpage And Distortion During Hot-Dipped Galvanizing Of Steel Articles.
- T. ASTM A385 - Providing High Quality Zinc Coatings (Hot Dip).
- U. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- V. ASTM A501 – Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- W. ASTM A510 – Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel
- X. ASTM A554 – Standard Specification for Welded Stainless Steel Mechanical Tubing.
- Y. ASTM A563/A563M – Standard Specification for Carbon and Alloy Steel Nuts.
- Z. ASTM A653/A653M-03 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the

Hot-Dip Process.

- AA. ASTM A666 – Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- BB. ASTM A743/A743M – Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application.
- CC. ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- DD. ASTM A786/A786M – Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
- EE. ASTM A793 – Standard Specification for Rolled Floor Plate, Stainless Steel.
- FF. ASTM A1008/A1008M - Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- GG. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- HH. ASTM B221/B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- II. ASTM C1107 – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
- JJ. ASTM E488 – Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements.
- KK. ASTM F593 – Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
- LL. ASTM F738M - Standard Specification for Stainless Steel Metric Bolts, Screws, and Studs.
- MM. ASTM F594 – Standard Specification for Stainless Steel Nuts.
- NN. ASTM F836M - Standard Specification for Style 1 Stainless Steel Metric Nuts.
- OO. AWS D1.1 - Structural Welding Code—Steel.

- PP. AWS D1.3 - Structural Welding Code--Sheet Steel.
- QQ. FS FF-325 - Shield, Expansion; Nail, Expansion; and Nail, Drive Screw. RR. FS FF-B-575C - Bolts, Hexagon and Square
- SS. FS FF-B-588 – Bolt, Toggle: And Expansion Sleeve, Screw.
- TT. NAAMM - Metal Finishes Manual
- UU. NAAMM - Metal Stair Manual.
- VV. NAAMM - Recommended Voluntary Minimum Standards for Fixed Metal Stairs.
- WW. SSPC-PA 1 - SEE SSPC 96-02 - Shop, Field, and Maintenance Painting - Included in a set (96-02) with PA 1, 2, 3, 4, 5 and QP1 and QP2I.
- XX. SSPC-SP6 - Commercial Blast Cleaning.

#### 1.5 SYSTEM PERFORMANCE REQUIREMENTS

- A. Structural Performance: Design, engineer, fabricate, and install the following metal fabrications to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each respective component of each metal fabrication.
- B. For items, components or assemblies to receive Hot Dip Galvanized Finish, Fabricator shall comply with detailing recommendations contained the AGA publication, "The Design of Products to be Hot Dip Galvanized After Fabrication". Detailing shall eliminate the need for field welding of hot dip galvanized fabrications.
- C. For galvanized coating applications to surfaces exposed to view, submit notarized Certificate of Compliance with ASTM Standards and Specifications listed herein, signed by galvanize applicator. In certificate, give detail description of material processed, include information as to the ASTM Standards used for coating, and include visual examination and test results.

#### 1.6 SUBMITTALS

- A. Product data for products used in miscellaneous metal fabrications, including finishes, paint products and grout.
- B. Shop drawings showing sizes and detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, profiles, and

details of metal fabrications and their connections. Indicate heights, sizes and spacings of components. Show anchorage, joinery and accessory items. Where installed metal fabrications are indicated to comply with certain design loadings, include structural computations, material properties, and other information needed for structural analysis that has been signed and sealed by the qualified professional engineer who was responsible for their preparation. Where applicable, indicate field verified dimensions on shop drawings.

1. Include setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed.
  2. Indicate field verified dimensions on shop drawings.
  3. Indicate on shop drawings location of gates and all details and dimensions. Provide cuts for all gate hardware.
- C. Samples representative of materials and finished products as may be requested by IDOT, in specified finish.
- D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under "Quality Assurance" article.
- E. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project name, addresses, names of Architects and Owners, and other information specified.
- F. Provide samples of specified finishes, including paint type coatings shop applied.
- G. Fabricator of items, components or assemblies listed in Section 05030 – Hot Dip Galvanizing shall provide letter certifying compliance with fabrication requirements of the section.

#### 1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.
- B. Installer Qualifications: Arrange for installation of metal fabrications specified in this section by same firm that fabricated them.
- C. Engineer Qualifications: Professional engineer licensed to practice in jurisdiction where project is located and experienced in providing engineering services of the kind indicated that have resulted in the successful installation of metal fabrications similar in material, design, and extent to that indicated for this Project.

- D. Regulatory Requirements: Comply with applicable requirements of all governing codes, ordinances and regulations. Fabricate and install handrails in accordance with the Americans with Disabilities Act (ADA) Guidelines.
- E. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel", or when applicable, comparable AWS D1.6 standards for stainless steel.
  - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- F. Pre-Installation Conference: Conduct conference at Project site to comply with requirements of Section 01200 "Project Meetings".
- G. Galvanize Coating Applicators Qualifications: Company specializing in hot dip galvanizing after fabrication and following the procedures of 'Quality Assurance Manual' of the American Galvanizers Association.
- H. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
  - 1. Build mockups for the following types of decorative metal:
    - a. Railings and Guardrails: Two full size adjacent modules for platform and stair railings and guardrails.
    - b. Windbreaks: One full size Windbreak.
    - c. Conduit Beam Covers: Two full size adjacent panels including one end cover.
    - d. Roofing over Exit Stair: One 8'-0" length of roofing showing edge conditions.
  - 2. Build at locations and to designs directed by the architect.
  - 3. Do not begin mock-up construction until the Commissioner is present.
  - 4. Adjust until mock-up appearance and workmanship are acceptable to the Commissioner.
  - 5. Upon completion of construction and at the direction of the Commissioner, completed and approved mock-ups may remain as part of the Work.

## 1.8 PROJECT CONDITIONS

- A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications shall fit, by accurate field measurements before



fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work. Verify all conditions for installation of the work.

- B. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions. Allow for adjustments, trimming and fitting.

#### 1.9 SEQUENCING AND SCHEDULING

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to project site in time for installation.
- B. Mount handrails only on completed walls or other construction. Do not support handrails temporarily by any means not satisfying structural performance requirements.

#### 1.10 DELIVERY, STORAGE, AND HANDLING

- A. Store fabricated components and materials in clean, dry locations, away from uncured concrete and masonry. Cover with waterproof paper, tarpaulin or polyethylene sheeting in a manner that permits air circulation within covering.
- B. Handle metalwork on site to a minimum; exercise care to avoid damaging metal finishes.

### PART 2 PRODUCTS

#### 2.1 FERROUS METALS

- A. Recycled Content of Steel Products: Provide products with average recycled content of steel products so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 20 percent.
- B. Metal Surfaces, General:
  - 1. For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, stains, discolorations, and, for steel sheet,

- "oil canning" and variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.
2. Provide materials for galvanizing that are geometrically suitable for galvanizing as described in ASTM A384 and A385.
- C. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- D. Steel Tubing: Product type (manufacturing method) and as follows:
1. Cold-Formed Steel Tubing: ASTM A500, Grade A, unless otherwise indicated or required for design loading.
    - a. For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A53.
    - b. For exposed galvanized installations and where indicated, provide materials with hot dip galvanized coating complying with ASTM A385.
- E. Uncoated Steel Sheet: Commercial quality, product type (method of manufacture) as follows:
1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M.
  2. Hot-Rolled Steel Sheet: ASTM A1011/A1011M.
- F. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
- G. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A47, or cast steel, ASTM A27/A27M. Provide bolts, washers, shims as required, hot-dip galvanized per ASTM A153.
- H. Elastomeric Pads: Comply with Section 783 of the Standard Specifications.
- I. Gray-Iron Castings: ASTM A48, Class 30.
- J. Malleable-Iron Castings: ASTM A47, Grade 32510 (ASTM A47M, Grade 22010).
- K. Rolled Steel Floor Plate: ASTM A786/A786M.
- L. Steel Bars for Gratings: ASTM A1011/A1011M or ASTM A36/A36M.
- M. Slotted Channel Framing: Cold-formed metal channels with continuous slots complying with MFMA-3.
1. Size channel as indicated.
  2. Fore Engineered Slotted Channel Framing: Provide size and number as determined by structural analysis.

## 2.2 FASTENERS

- A. General: Stainless steel fasteners shall be used for all locations. Do not use metals that are corrosive or otherwise incompatible with metals joined. Select fasteners for the type, grade, and class required and for type of loading and installation condition shown or as specified by the manufacturer.
  - 1. Provide concealed fasteners for interconnection of decorative metalwork components and for their attachment to other work except where exposed fasteners are unavoidable or are the standard fastening method.
  - 2. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.
- B. Bolts and Nuts: Regular hexagon head type, ASTM A307, Grade A (ASTM F568M, Property Class 4.6), with hex nuts, ASTM A563/A563M, ASTM F593 stainless-steel bolts with ASTM F594 Nuts and, where indicated, flat washers.
- C. Lag Bolts: ANSI B18.2.1.
- D. Machine Screws: ANSI B18.6.3.
- E. Plain Washers: Round, carbon steel, ANSI B18.22.1.
- F. Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.
- G. Expansion Anchors: Anchor bolt and sleeve assemblies of type as required for installation condition shown; and of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E488 conducted by a qualified independent testing agency.
  - 1. Material: Stainless-steel bolts and nuts complying with ASTM F593/F738M and ASTM F594/F836M.
- H. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class, and style as required.
- I. Primer Paint: As specified in Section 09960, High-Performance Coatings.

## 2.3 WELDING

- A. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded. Provide type and alloy of filler metal and electrodes as specified by producer of metal to be welded, complying

with applicable AWS specifications, and as required for color match, strength and compatibility in the fabricated items.

## 2.4 GROUT

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically specified by manufacturer for interior and exterior applications. For galvanized surfaces exposed to view, comply with ASTM A385.
- B. Products:
  - 1. Non-Shrink, Nonmetallic Grouts:
    - a. B-6 Construction Grout; W. R. Bonsal Co.
    - b. Diamond-Crete Grout; Concrete Service Materials Co.
    - c. Supreme; Cormix Construction Chemicals.
    - d. Sure-grip High Performance Grout; Dayton Superior Corp.
    - e. Euco N-S Grout; Euclid Chemical Co.
    - f. Five Star Grout; Five Star Products.
    - g. Vibropruf #11; Lambert Corp.
    - h. Crystex; L&M Construction Chemicals, Inc.
    - i. Masterflow 928 and 713; Master Builders Technologies, Inc.
    - j. Sealtight 588 Grout; W. R. Meadows, Inc.
    - k. SonogROUT 14; Sonneborn Building Products--ChemRex, Inc.
    - l. Kemset; The Spray-Cure Company.

## 2.5 FABRICATION, GENERAL

- A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.
- B. Form exposed work true to line and level with accurate angles, curves and surfaces and straight sharp edges. Form to required shapes and sizes. Finish exposed surfaces to smooth, sharp, well-defined lines and arrises.
- C. Allow for thermal movement resulting from 100 degrees Fahrenheit maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.

- D. Shear and punch metals cleanly and accurately. Remove burrs.
- E. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- F. Remove sharp or rough areas on exposed surfaces.
- G. Weld corners and seams continuously to comply with AWS specifications and the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent. Grind exposed welds flush and smooth to match and blend with adjoining surfaces.
- H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous. Cope or miter corner joints.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
- J. Provide necessary lugs and brackets for assembly of units. Use concealed fasteners wherever possible.
- K. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- L. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.
- M. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

## 2.6 ROUGH HARDWARE

- A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers,

dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures.

- B. Fabricate items to sizes, shapes, and dimensions required. Furnish stainless steel washers for heads and nuts.

## 2.7 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required.
- B. Hot dip galvanize bearing and leveling plates.

## 2.8 MISCELLANEOUS FRAMING AND SUPPORTS

- A. Provide steel framing and supports for applications indicated or which are not parts of structural steel framework, as required to complete work.
- B. Provide shop drawings showing applicable field verified sizes, details. Coordinate with supplier of equipment or product framing is supporting, if applicable.
- C. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed. Except as otherwise indicated, space anchors 24 inches on center and provide minimum of 2 anchors per unit when unit is 24 inches or less. Secure miscellaneous framing securely to structure by welding or anchoring as approved. Install to withstand all applicable loadings and stresses.
- D. Galvanize miscellaneous framing and supports after fabrication, touch up galvanizing in field, and also prime and paint any exposed surfaces. Refer to Section 09960, High- Performance Coatings, for painting requirements.

## 2.9 MISCELLANEOUS STEEL TRIM

- A. Provide shapes and sizes indicated for profiles shown. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages as

required for coordination of assembly and installation with other work.  
Anchorages to be concealed unless approved otherwise.

- B. Galvanize miscellaneous steel trim, framing and supports after fabrication. Also prime and provide top coats for any exposed steel trim. Refer to Section 09960, High- Performance Coatings, for painting requirements.

## 2.10 STEEL PLATE CLOSURES, COVERS, FRAMES AND PANELS

- A. Provide the required sizes, shapes and profiles. Except as otherwise shown, fabricate from structural steel plate of all welded construction using mitered corners, welded brackets and splice plates, and a minimum number of joints for field connection. Cut, drill and tap units to receive hardware and similar items to be anchored to the work. Neatly dress risers arrises, edges, corners and welds so as to be flush, straight, and square for best appearance.
- B. Flatness Tolerance: Deviations for faces of flat panels shall not exceed 1/16 inch in 4 foot-0 inch at any location, and 1/8 inch total for the entire face.
- C. Provide all fasteners, mounting plates, angles and framing necessary to securely fasten fabricated panels to structure at finished as hot dip galvanized.
- D. Hot dip galvanize ferrous metal fabrications. Also provide primer and top coats for exposed steel. Refer to Section 09900, Painting, for painting requirements.

## 2.11 FINISHES, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes for all metals.
- B. Finish metal fabrications after assembly.
- C. Protect mechanical finishes on exposed surfaces from damage by application of strippable temporary protective covering prior to shipment.
- D. Exposed Galvanized Steel: Where exposures of galvanized steel to public view occur and where indicated, conform to ASTM A384 and A385.
  - 1. Avoid fabrication techniques that could cause distortion or embrittlement of the steel.
  - 2. Consult with Engineer and galvanizer regarding potential problems during galvanizing that might require modification of design. Consult Engineer before fabrication proceeds.

3. Remove all welding slag, splatter, anti-splatter compounds, and burrs before delivery to galvanizer.
  4. Provide holes and / or lifting lugs to facilitate handling during the galvanizing.
  5. Avoid unsuitable marking paints. Remove grease, oil paint, and other deleterious materials before fabrication.
  6. Remove by blast cleaning or other approved methods, surface contaminates, and coatings that are not removable by normal chemical cleaning process in the galvanizing process.
  7. Whenever, possible, use slip joints to minimize field welding.
  8. Coating Weight: Provide coating weight s per table 1, ASTM A126 with minimum coating thickness on any galvanized item of 460g/m<sup>2</sup> (Grade 65). Conform to paragraph 5.2 of ASTM A123, Table q of ASTM A767, or Table 1 of ASTM A153, as appropriate. Refer to ASTM A123 3.1.7 for special thickness requirements and provide minimum average mils of thickness.
  9. Provide surfaces finish that is continuous, adherent, smooth and evenly distributed, and free from any defect detrimental to stated use of coated article.
  10. Provide adhesion to withstand normal handling.
  11. Test and inspect coated article following guidelines stated in AGA's "Inspection of Products Hot Dip Galvanized after Fabrication."
- F. Exposed Galvalume: For metal surfaces indicated as having a Galvalume finish, including, but not limited to conduit beam covers and roofing over exit stairs, conform to ASTM Specification A792 "Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process." Minimum coating weight: AZ55.

## 2.12 STEEL AND IRON FINISHES

- A. Galvanizing: When indicated as galvanized on the Drawings, galvanize items fabricated from ferrous metal. Apply zinc-coating by the hot-dip process after fabrication of assemblies. Galvanize in compliance with the following requirements:
1. ASTM A153 for galvanizing iron and steel hardware.
  2. ASTM A123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick and heavier.
- B. Preparation for Galvanizing: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
1. SSPC Zone 1B: SSPC-SP6.



- C. Where steel is to also be finished with primer and top coats, apply shop primer to galvanized surfaces of metal fabrications, except portions to be embedded in concrete or masonry. Comply with requirements of SSPC-PA1. Stripe paint all edges, corners, crevices, bolts, welds, and sharp edges.

## PART 3 EXECUTION

### 3.1 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.
- B. Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.
- C. Field verify all dimensions and conditions for the installation of all metal fabrications. Coordinate with approved shop drawings.

### 3.2 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required. Secure to meet all design loading and stresses.
  - 1. Except where otherwise shown or specified, fasten metal fabrications to solid concrete or masonry with expansion bolts.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels. Provide temporary bracing or anchors in formwork for items, which are to be built into concrete, masonry or similar construction.
- C. Fit exposed connections accurately together to form hairline joints or, where indicated, with uniform reveals and spaces for sealants and joint fillers. Where cutting, welding and grinding are required for proper shop fitting and jointing of metal items, restore finishes to eliminate any evidence of such corrective work.
- D. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the

surfaces of exterior units, which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections. Grind exposed welded joints smooth and restore finish to match finish of adjacent surfaces.

- E. Field Welding: Comply with applicable AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, and the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. Weld connections, which cannot be shop welded because of shipping size limitations.
  - 5. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.
- F. Do not cut or abrade finishes, which cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing or provide new units as required.
- G. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint or zinc chromate primer.
  - 1. Paint the contact surfaces of dissimilar materials and metal other than aluminum in contact with masonry or concrete work, with a heavy coating of epoxy paint.

### 3.3 SETTING LOOSE PLATES

- A. Clean concrete bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
- B. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.
  - 1. Use nonmetallic non-shrink grout unless otherwise indicated.
  - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

### 3.4 INSTALLATION OF RAILINGS, HANDRAILS, BARRIERS, HIGH BARRIERS AND FENCES

- A. Adjust railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loadings. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:
1. Anchor posts in concrete by core drilling holes not less than 5 inches deep and 3/4 inch greater than outside diameter of post. Clean holes of all loose material, insert posts and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's directions.
  2. Anchor posts to steel with steel oval flanges, angle type or floor type as required by conditions, welded to posts and bolted to steel supporting members.
  3. Anchor rail ends into concrete with steel flanges welded to rail ends and anchored into wall construction with lead expansion shields and bolts.
  4. Anchor rail ends to steel with steel flanges welded to rail ends and bolted to structural steel members, unless otherwise indicated.
- B. Secure handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1-1/2 inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated, or if not indicated, at spacing required to support structural loads. Secure wall brackets and wall return fittings to building construction as follows:
1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
  2. Use type of bracket with pre-drilled hole for exposed bolt anchorage.
  3. For concrete anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable.
- C. Align rails so that variations from level for horizontal members and from parallel with rake of steps for sloping members do not exceed 1/4 inch in 12 feet. Align at abutting joints.
- D. Welded Connections: Use fully welded joints; cope or butt components to provide full contact. At exposed welded connections, finish exposed welds and surfaces smooth and blended so that no roughness is evident (by sight or touch) after finishing, and welded surface matches contours of adjoining surfaces.
- E. Expansion Joints: Provide expansion joints at locations indicated, or if not indicated, at intervals not to exceed 40 feet. Provide slip joint with internal sleeve extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6 inches of posts.
- F. Install railings, cane rail, barriers and gates as shown on drawings. Install all hardware for gate, provide all required accessories, and make all necessary

adjustments.

- G. Installation to be rigid, straight, level, and secure. Installation to meet all applicable codes. Touch up any paint finish after installation.

### 3.5 ADJUSTING AND CLEANING

- A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touch-up of field painted surfaces. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. For galvanized surfaces of fabrications other than those listed in Section 05030, clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A780.
- C. Clean stainless steel with soap and water; rinse with clear water.

### 3.6 FINISHES

- A. Unless fabricated of prefinished material or stainless steel, all metal fabrications to be hot dip galvanized in the factory after fabrication per referenced standards.
- B. For fabrications, other than those listed in Section 05030, exposed to view, finish galvanized fabrications in the shop, if possible, by cleaning galvanized surfaces, priming and application of finish coats. Follow paint manufacturer's recommendations. See Painting Section of these specifications for painting system. Touch up any welded or otherwise damaged galvanized surfaces with galvanizing repair paint prior to prime and finish coats.
- C. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting.
- D. Where exposure to view and no painting occurs on galvanized surface, repair damaged areas by one of the methods described in ASTM A780 whenever damage exceeds 3/16- inch in width. Provide minimum thickness of repair as described in ASTM A123 Section 4.6.

### 3.7 PROTECTION

- A. Protect finishes of metalwork from damage during construction period by use of temporary protective coverings approved by fabricators. Remove protective covering at time of substantial completion.

- B. For pre-finished surfaces or stainless steel, restore protective coverings, which have been damaged during shipment or installation of the work. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at the same location. Retain protective coverings intact and remove simultaneously from similarly finished items to preclude non-uniform oxidation and discoloration.
- C. Restore finishes damaged during installation and construction period so that no evidence remains of corrective work. Return items which cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units as required.

END OF SECTION 05 50 00

SECTION 07 60 00  
FLASHING AND SHEET METAL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and Division 1 Specification Sections, apply to this section.

1.02 SUMMARY

- A. This Section includes the following:
1. Pre-painted formed galvanized metal gutter, flashing and downspouts.
  2. Fasteners, attachment devices, and accessories.
- B. The following are specified elsewhere:
1. Translucent Canopy Roof Assembly and related aluminum flashing installed integral with polycarbonate panel system are specified in the Translucent Canopy Roofing Section.

1.03 REFERENCES

- A. Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractor's National Association, Inc. (SMACNA); 1993.
- B. ASTM A 653: Standard Specification for Steel Sheet, Zinc-coated (Galvanized) by the Hot-Dip Process, and Lock-Forming Quality; 1990.

1.04 RELATED SECTIONS

- A. The following sections contain requirements that relate to this section:
1. Division 08 Section, Translucent Canopy Roof.

1.05 SUBMITTALS

- A. General: Submit the following in accordance with Division 01 Section, Submittals.
- B. Product data for sheet metal, flashing, cleats and accessories: Manufacturer's technical product data, installation instructions and general specifications for each specified sheet material and fabricated product.
- C. Samples of all sheet metal, flashing, cleats, and accessory items or fabrications, including fastening devices:

1. 8-inch-square or 12 inch long samples of each specified sheet material or product in the type of metal and finish required.
- D. Samples for Initial Selection: For each type of pre-finished sheet metal, flashing and accessories indicated with factory-applied color finishes, provide color samples and sample in actual selected finish and color.

#### 1.06 QUALITY ASSURANCE

- A. Installer: A company familiar with installing products included in this section and which has completed at least twenty (20) installations similar in scope to work included in this section.
- B. Quality Standard:
1. Fabricate and install sheet metal work in accordance with Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA) "Architectural Sheet Metal Manual," unless specifically indicated otherwise.
- C. Provide and install sheet metal to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, including leaking and/or fastener disengagement.
1. Fabricate and install sheet metal to comply with recommendations of FM Loss Prevention Data Sheet 1-49 for wind zone appropriate to project site.
- D. Thermal Movements: Provide sheet metal that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F., ambient; 180 deg F., material surfaces.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sheet metal, flashing and trim materials and fabrications undamaged. Protect sheet metal, flashing and trim materials and fabrications during transportation and handling.

- B. Unload, store, and install sheet metal, flashing and trim materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with suitable weather-tight and ventilated covering. Do not store sheet metal, flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

#### 1.08 PROJECT CONDITIONS

- A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

### PART 2 PRODUCTS

#### 2.01 SHEET METAL MATERIALS

- A. Pre-painted, Metallic-Coated Steel Sheet: Steel Sheet metallic coated by the hot-dip process and pre-painted to comply with ASTM A755.
  - 1. Zinc-coated (Galvanized) Steel Sheet: ASTM A 653/A, G90 (Z275) hot-dip galvanized coating designation; structural quality.
  - 2. Minimum thickness 0.0359 inch thick (20 gage) except as otherwise indicated.

#### 2.02 ACCESSORY MATERIALS

- A. Fasteners: Corrosion-resistant metal of same material as the material being fastened, stainless steel, or other material recommended by sheet metal manufacturer. Match finish and color of exposed accessories and fastener heads to finish and color of sheet material being fastened. Fasteners to be designed and spaced to withstand design loads. Screw, screw/plate, anchor systems:
  - 1. Maxiseal HWH Traxx/1 (CL) with encapsulated EPDM washers.
  - 2. HWH Trugrip series with EPDM washers by ITW Buildex.
  - 3. Tapcon series with Climaseal coating by ITW Buildex.
  - 4. Masonry Zamac Nailins with Zinc Anchor by Rawl.
- B. Sealant: As specified in Division 07.
  - 1. Use non-curing type for concealed joints.
  - 2. Use non-sag elastomeric type for exposed joints.
- C. Joint Adhesive: Two-component noncorrosive epoxy adhesive, recommended by



metal manufacturer for sealing of nonmoving joints.

- D. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching with material being installed; non-corrosive; size and thickness required for performance.
- F. Water-Stop Membrane: Ice and Water Shield by W.R. Grace Co. or equivalent.

## 2.03 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.
  - 1. Fluoropolymer 3-Coat System: Manufacturer's standard 3-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight, with a minimum total dry film thickness of 1.5 mil (0.038 mm); complying with physical properties and coating performance requirements of AAMA 2605, except as modified below:
    - a. Humidity Resistance: 2000 hours.
    - b. Salt-Spray Resistance: 2000 hours.
  - 2. Color: As selected by Authority from the manufacturer's standard color selections.
- E. Touch up finish as required after fabrication, forming, drilling or cutting.
- F. Provide strippable plastic protective film on prefinished surface.

## 2.04 MANUFACTURERS

- A. Provide products complying with requirements of the contract documents and made by one of the following:
  - 1. Prefinished Galvanized Steel Sheet:
    - a. Atas Aluminum Corporation.
    - b. Copper Sales, Inc.
    - c. MM Systems Corporation.
    - d. Petersen Aluminum Corporation.
    - e. Vincent Metals Division/Rio Algom, Inc.

## 2.05 FABRICATED UNITS

- A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and specifications for forming material. Form exposed sheet metal to match profiles indicated free of oil-canning, fish-mouths, buckling, tool marks, and other defects; true to line and levels indicated. Form a 1/2 inch hem, folded back, on underside of exposed edges.
- B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
- C. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Form seams, and solder. Rivet joints for additional strength where required.
- D. Expansion Provisions: Provide for thermal expansion of exposed sheet metal work exceeding ten (10) foot running length. For flashing and trim, provide movement joints at maximum spacing of ten (10) feet; no joints allowed within two (2) feet of corner or intersection. Where lapped or bayonet-type expansion provisions in work cannot be used or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than one" deep, filled with mastic sealant (concealed within joints).
- E. Conceal fasteners and expansion provisions wherever possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.
- F. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.

1. Gauge: As specified or as recommended by SMACNA or metal manufacturer for application, but in no case less than gauge of metal being secured.
- G. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.
- H. Separations: Provide for separation of metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating slip sheets to isolate sheet metal from dissimilar materials, or other permanent separation as specified by manufacturer/fabricator.

## 2.06 FLASHING AND COUNTERFLASHING

- A. Base Flashing: Fabricate from the following material:
  1. Pre-painted, Metallic-Coated Steel: 22 gauge or 0.0276 inch thick, minimum.
- B. Counter-Flashing: Fabricate from the following material:
  1. Pre-painted, Metallic-Coated Steel: 24 gauge or 0.0217 inch thick, minimum.
  2. Height: 4 inches.

## 2.09 GUTTERS AND DOWNSPOUTS

- A. Fabricate from prefinished galvanized steel.
- B. Form sheet metal to profile dimensions indicated or to match existing, free from distortions and defects detrimental to water tight system.
  1. Seam and seal metal joints except for joints indicated by SMACNA to be welded.
- C. Provide expansion joints in gutters at spacing not to exceed 30 feet.
- D. Provide removable debris screens for gutters, fabricated from ¼ inch mesh wire cloth of same material used for gutters or approved compatible material. Provide formed sheet metal frame on 4 sides of each screen unit. Length of screen units not to exceed 10 feet.
- E. Provide wire basket type strainers at downspouts, fabricated from wire and sheet metal of same material used for downspouts or approved compatible material.
- F. Provide straps of same material and same finish and color for attachment of gutters and downspouts.

- G. Back-paint concealed metal surfaces with bituminous coating to a minimum of 15 mils dry film thickness.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates and conditions under which products of this section are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
- B. Isolate dissimilar metals by means of a heavy bituminous coating, approved paint coating, adhered polyethylene sheet, or other means approved by the Authority.

### 3.03 INSTALLATION

- A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and specifications and with SMACNA "Architectural Sheet Metal Manual". Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work to fit substrates and with laps, joints, and seams that will be permanently watertight and weatherproof.
- B. Torch cutting of sheet metal flashing and trim is not permitted.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.
  - 1. Coat side of uncoated sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
  - 2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene underlayment.
- D. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.

- E. Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks. Fold back exposed edges to form hems. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal. Install to fit substrate and to result in watertight performance.
  - 1. Space cleats continuous or not more than 12 inches apart. Anchor each cleat with two fasteners or at 16" centers. Bend tabs over fasteners.
- F. Secure metal flashings and other items as recommended by manufacturer and as required for wind design loads.
- G. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.
- H. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 3/4 inch (19 mm) for screws.
  - 1. Galvanized or Pre-painted, Metallic-Coated Steel: Use stainless-steel fasteners.
- I. Seal joints with elastomeric sealant as required for watertight construction.
  - 1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
  - 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."
- J. Sealed Joints: Form minimum 1-inch hooked joints and embed flange into sealant or adhesive. Form metal to completely conceal sealant or adhesive.
  - 1. Use joint adhesive for nonmoving joints specified not to be soldered.
  - 2. Moving joints: When ambient temperature is moderate (40-70 degrees F) at time of installation, set joined members for 50 percent movement either way. Adjust setting position of joined members proportionally for temperatures above 70 degrees F. Do not install sealant at temperatures below 40 degrees F. Refer to section on sealants elsewhere in Division 7 for handling and installation requirements for joint sealers.

3.04 FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.

3.07 ROOF DRAINAGE SYSTEM INSTALLATION

- A. Install gutter and downspout with straps and anchors recommended by SMACNA's Manual or the item manufacturer, to drain roof in the most efficient manner. Coordinate roof drain flashing installation with roof drainage system installation. Coordinate flashing and sheet metal items with roofing installation. Install continuous gutter screens on gutters with noncorrosive fasteners, arranged as hinged units to swing open for cleaning gutters.

3.08 CLEANING AND PROTECTION

- A. Remove protective film from pre-finished sheet metal immediately after installation. Clean off excess sealants.
- B. Clean exposed metal surfaces, removing substances that might cause metal corrosion or finish deterioration.
- C. Repair or replace work which is damaged or defaced, as directed by the Authority.
  - 1. Refinish marred and abraded areas of pre-finished sheet using finish manufacturer's recommended methods and materials. Replace units which, in the opinion of the Authority, cannot satisfactorily be refinished in place.
- D. Protect sheet metal work as recommended by the installer so that completed work will be clean, secured, and without damage at substantial completion.
- E. Upon completion of flashing installation, clean finished surfaces and remove all excess materials, fasteners and debris immediately so as to avoid damage to the roof.

END OF SECTION 07 60 00

SECTION 07 90 00  
JOINT SEALERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and Division 1 Specification Sections, apply to this section.

1.02 SUMMARY

- A. This Section includes joint sealers for the project:
1. Exterior joints in vertical and horizontal surfaces:
    - a. Perimeter joints between materials, flashing, roof items and other items.
    - b. As required for an air and water tight joints.
    - c. Other joints as indicated.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Division 07 Section: "Flashing and Sheet Metal"
  2. Division 08 Section: "Translucent Canopy Roof".

1.03 SYSTEM PERFORMANCES

- A. Provide joint sealers that have been produced and installed to establish and maintain watertight and airtight continuous seals.

1.04 SUBMITTALS

- A. Product Data from manufacturers for each joint sealer product required, including instructions for joint preparation and joint sealer application.
- B. Certificates from manufacturers of joint sealers attesting that their products comply with specification requirements and are suitable for the use indicated.
- C. Qualification data complying with requirements specified in "Quality Assurance" article.

- D. Compatibility and adhesion test reports from elastomeric sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and specifications for primers and substrate preparation needed to obtain adhesion.
- E. Product test reports for each type of joint sealers indicated, evidencing compliance with requirements specified.

#### 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an Installer who has successfully completed applications similar in type and size to that of this Project.
- B. Single Source Responsibility for Joint Sealer Materials: Obtain joint sealer materials from a single manufacturer for each different product required.
- C. Preconstruction Compatibility and Adhesion Testing:  
Submit samples of all materials that will contact or affect joint sealers to joint sealer manufacturers for compatibility and adhesion testing.
  - 1. Use test methods standard with manufacturer to determine if priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealers to joint substrates. Perform tests under normal environmental conditions that will exist during actual installation.
  - 2. Schedule sufficient time for testing and analysis of results to prevent delay in the work progress.
  - 3. Investigate materials failing compatibility or adhesion tests and obtain joint sealer manufacturer's written specifications for corrective measures, including use of specially formulated primers.
  - 5. Testing will not be required when joint sealer manufacturer is able to submit joint preparation data based on previous testing of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.
- D. Product Testing: Provide comprehensive test data for each type of joint sealer based on tests conducted by a qualified independent testing laboratory on current product formulations within a 24-month period preceding date of Contractor's submittal of test results to the Authority.
  - 1. Test elastomeric sealants for compliance with requirements specified by reference to ASTM C 920. Include test results for hardness, stain resistance, adhesion and cohesion under cyclic movement (per ASTM C 719), low-temperature flexibility, modulus of elasticity at 100 percent strain, effects of heat aging, and effects of accelerated weathering.
  - 2. Include test results performed on joint sealers after they have cured 1 year.



- E. Preconstruction Field Testing: Prior to installation of joint sealants, field-test their adhesion to joint substrates as follows:
1. Locate test joints where indicated or, if not indicated, as directed by Authority.
  2. Conduct field tests for each type of elastomeric sealant and joint substrate indicated.
  3. Arrange for tests to take place with joint sealer manufacturer's technical representative present.
  4. Test Method: Test joint sealers by hand pull method described below:
    - a. Install joint sealants in 5-foot joint lengths using same materials and methods for joint preparation and joint sealant installation required for completed Work. Allow sealants to cure fully before testing.
    - b. Make knife cuts as follows: A horizontal cut from one side of joint to the other followed by 2 vertical cuts approximately 2 inches long at side of joint and meeting horizontal cut at top of 2 inch cuts. Place a mark 1 inch from top of 2 inch piece.
    - c. Use fingers to grasp 2 inch piece of sealant just above 1 inch mark; pull firmly down at a 90 degree angle or more while holding a ruler along side of sealant. Pull sealant out of joint to the distance specified by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.
  5. Report whether or not sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.
  6. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants which fail to adhere to joint substrates during testing.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle materials in compliance with manufacturers' specifications to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

## 1.07 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of joint sealers under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturers.
  - 2. When ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturer or below 40 deg F.
  - 3. When joint substrates are wet due to rain, frost, condensation, or other causes.
- B. Joint Width Conditions: Do not proceed with installation of joint sealers where joint widths are less or more than allowed by joint sealer manufacturer for application indicated.
- C. Joint Substrate Conditions: Do not proceed with installation of joint sealers until contaminants capable of interfering with their adhesion are removed from joint substrates.

## PART 2 PRODUCTS

### 2.01 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Colors: Provide color of exposed joint sealers indicated or, if not otherwise indicated, as selected by the Authority from manufacturer's standard colors.

### 2.02 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses.
- B. One Part Mildew Resistant Silicone Sealant (Toilet): Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide; intended for sealing interior joints with nonporous substrates and subject to in service exposure to conditions of high humidity and temperature extremes.

- C. One Part High-Modulus Nonacid-Curing Silicone Sealant: Type S, Grade NS, Class 25, Uses NT, M, G, A, and, as applicable to joint substrates indicated, O.
- D. Available Products: Subject to compliance with requirements, elastomeric sealants which may be incorporated in the Work include, but are not limited to, the following:
  - 1. One Part Mildew Resistant Silicone Sealant:
    - a. "Dow Corning 786"; Dow Corning Corp.
    - b. "SCS 1702 Sanitary"; General Electric Co.
    - c. "863 #345 White"; Pecora Corp.
    - d. "Rhodorsil 6B White"; Rhone-Poulenc Inc.
    - e. "Proglaze White"; Tremco Corp.
    - f. "OmniPlus"; Sonneborn Bldg Prod. Div., Rexnord Chem. Prod. Inc
  - 2. One Part High-Modulus Nonacid-Curing Silicone Sealant:
    - a. "Dow Corning 799", Dow Corning Corp.
    - b. "Ultraglaze SSG 4000", General Electric Co.

#### 2.04 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type which are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, non-staining, non-waxing, non-extruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
  - 1. Open-cell polyurethane foam.
  - 2. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, non-outgassing in unruptured state.
  - 3. Proprietary, reticulated, closed-cell polymeric foam, nonoutgassing, with a density of 2.5 pcf and tensile strength of 35 psi per ASTM D 1623, and with water absorption less than 0.02 gms/cc per ASTM C 1083.
  - 4. Any material indicated above.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as specified by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

## 2.05 MISCELLANEOUS MATERIALS

- A. Primer: Provide type specified by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealer-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Provide non-staining, chemical cleaners of type which are acceptable to manufacturers of sealants and sealant backing materials, which are not harmful to substrates and adjacent nonporous materials, and which do not leave oily residues or otherwise have a detrimental effect on sealant adhesion or in-service performance.
- C. Masking Tape: Provide non-staining, nonabsorbent type compatible with joint sealants and to adjacent surfaces.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine joints indicated to receive joint sealers, with Installer present, for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer performance. Do not proceed with installation of joint sealers until unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with specifications of joint sealer manufacturers and the following requirements:
  - 1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; old joint sealers; oil; grease; waterproofing; water repellants; water; surface dirt; and frost.
  - 2. Clean concrete, masonry, and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
  - 3. Remove laitance and form release agents from concrete.
  - 4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile; and other nonporous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.

- B. Joint Priming: Prime joint substrates where indicated or where specified by joint sealer manufacturer based on preconstruction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's specifications. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.03 INSTALLATION OF JOINT SEALERS

- A. General: Comply with joint sealer manufacturers' printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Elastomeric Sealant Installation Standard: Comply with specifications of ASTM C 1193 for use of joint sealants as applicable to materials, applications and conditions.
- C. Solvent-Release-Curing Sealant Installation Standard: Comply with requirements of ASTM C 1193 for use of solvent-release-curing sealants.
- D. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
  - 1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant movement capability.
    - a. Do not leave gaps between ends of joint fillers.
    - b. Do not stretch, twist, puncture, or tear fillers.
    - c. Remove absorbent joint fillers which have become wet prior to sealant application and replace with dry material.
  - 2. Install bond breaker tape between sealants and joint fillers, compression seals, or back of joints where adhesion of sealant to surfaces at back of joints would result in sealant failure.
  - 3. Install compressible seals serving as sealant backings to comply with requirements indicated for fillers.

- E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.
- F. Tooling of Non-sag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer. Provide concave joint configuration per Figure 6A in ASTM C 1193, unless otherwise indicated.
- G. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, and to comply with sealant manufacturer's directions for installation methods, materials, and tools which produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's specifications.
- H. Installation of Preformed Hollow Neoprene Gaskets: Install gaskets, with minimum number of end joints, in joint recesses with edges free of spalls and sides straight and parallel, both within tolerances specified by gasket manufacturer. Apply manufacturer's specified adhesive to joint substrates immediately prior to installing gaskets. For straight sections provide gaskets in continuous lengths; where changes in direction occur, adhesively splice gasket together to provide watertight joint. Recess gasket below adjoining joint surfaces by 1/8 to 1/4 inch.

#### 3.04 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

3.05 PROTECTION

- A. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.

END OF SECTION 07 90 00

SECTION 08 90 00  
TRANSLUCENT CANOPY ROOF

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 framed assemblies glazed with multi-walled (structured) polycarbonate panels as follows:
1. Translucent canopies – see drawings for full extent of translucent canopies
  2. Manufacturer standard sheet metal flashings and closures.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Division 5 Section “Structural Steel for steel framing that supports structured polycarbonate panel assemblies.
  2. Division 7 Section “Sheet Metal Flashing and Trim” for related metal flashings and flashing material requirements.
  3. Division 7 Section “Joint Sealers” for sealants installed at perimeters of assemblies

1.03 REFERENCES

- A. ASTM D635 – Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
- B. ASTM D1929 – Ignition Temperature of Plastics.
- C. ASTM D2843 – Density of Smoke.
- D. ASTM E84 – Surface Burning Characteristics of Building Materials.
- E. ASTM D2244 – Color Changes
- F. ASTM D1003 – Losses in Light Transmission



#### 1.04 DESIGN REQUIREMENTS

- A. Basic Wind Speed: 90 mph
- B. Wind Exposure Category: B.
- C. Wind, Snow and Concentrated Loads on Canopy Assemblies as indicated on Structural Drawings.
  - 1. Transit Maintenance Worker roof canopy live load:  
300lb point load (foot step) applied to any point on the Canopy Assembly, including the polycarbonate panel.
- D. Roof Assemblies: Class A per ASTM E108 or UL 790
- E. Maximum Allowable Deflection of Overhead Canopy Assemblies: L/180 of clear span for each assembly component.
  - 1. Combined Maximum Deflection: 1-inch (Verify).
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces.
- G. Provide assemblies, including anchorage, capable of withstanding, without failure, the effects of the following:
  - 1. Structural Loads.
  - 2. Live loads – wind, snow and maintenance worker point load.
  - 3. Thermal Movements.
  - 4. Movements of supporting structure.
- H. Failure includes the following:
  - 1. Deflection exceeding specified limits.
  - 2. Water leakage.
  - 3. Thermal stresses transferred to supporting structure.
  - 4. Noise or vibration created by wind, thermal and structural movements.

5. Loosening or weakening of fasteners, attachments and other components.
6. Color changes or discoloration beyond limits of ASTM requirements.
7. Loss of light transmission beyond limits of ASTM requirements.

#### 1.06 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for materials, components, fabrication, finish and installation instructions. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for assemblies.
- B. Samples for Verification: 12 inch square samples of each type of glazing and other material indicated, and 12 inch long samples of each color required for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative of adjoining framing system in color.
- C. Fabrication Sample: Of each framing intersection (interior and perimeter) made from 12" lengths of full-sized components and showing details of the following:
  1. Joinery.
  2. Anchorage.
  3. Expansion provisions.
  4. Structured polycarbonate panels.
  5. Flashing and drainage.
- D. Shop Drawings: For assemblies, including plans, elevations, sections, details, and attachments to other work.
  1. Indicate dimensions, tolerances, profiles, anchorage, connections, fasteners, hardware, provisions for expansion and contraction, drainage, flashing, finish, and attachments to supports of glazing, framing and options.
  2. Provide engineering and drafting of Production Documents (Shop Drawings) including structural calculations of the entire structured polycarbonate panel system.
  3. Provide Shop Drawings signed and sealed by a licensed State of Illinois Structural Engineer stating compliance with structural design requirements.

- E. Certificate: Submit certificates from respective manufacturers attesting that materials furnished for project comply with requirements.
- F. Compatibility and Adhesion Test Report: Submit statement from sealant manufacturer indicating that materials have been tested for compatibility and adhesion with sealants and interpreting test results relative to material performance, including specifications for primers and substrate preparation needed to obtain adhesion.
- G. Qualification Data for Contractors: Demonstrate installation contractor capabilities and experience. Include lists of completed projects with project names and addresses.
- H. Product Test Reports: From a qualified testing agency indicating the products comply with requirements, based on comprehensive testing of current products. Provide testing data asserting that the assemblies comply with test performance requirements indicated, as evidenced by reports of tests performed on manufacturer's standard assemblies:
  - 1. Flame and smoke testing.
  - 2. Wind load testing.
  - 3. Water penetration testing.
  - 4. Stabilization of color and transparency testing
- I. Performance Testing
  - 1. Provide testing data asserting that the assemblies comply with test performance requirements indicated, as evidenced by reports of tests performed on manufacturer's standard assemblies with regards to wind load, water penetration,
- J. Preconstruction Adhesion and Compatibility Test Report:
  - 1. From sealant manufacturer indicating glazing sealants were tested for adhesion to substrates and for compatibility.
- K. Maintenance Data: For assemblies to include in maintenance manuals.
- L. Warranties: Warranties and Special Warranties specified in this Section.

1.07 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Continuously engaged in translucent insulated daylighting manufacturing with a minimum of ten years of experience.
2. Able to demonstrate successful performance on comparable projects.
3. Responsible for all components.

B. Installer Qualifications:

1. Entity capable of assuming engineering responsibility, capable of performing work of this Section, and who is acceptable to manufacturer

C. Testing Agency Qualifications:

1. An independent agency qualified according to ASTM E699 for testing required.

D. Product Testing: Obtain test results for product test reports indicated in "Submittals" Article.

1. Contractor shall provide a testing subcontractor, as defined in the Division 01 Section, "Reference Standards and Definitions", to perform glazing testing and monitoring thereof. Such testing and monitoring shall be performed in accordance with the Division 1 Section, "Testing and Inspection Service".

E. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.

1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated, as documented according to ASTM E699.
2. Test elastomeric glazing sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

- F. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glass type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants.
1. Use manufacturer's standard test methods to determine whether priming and other specific preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
    - a. Perform tests under normal environmental conditions replicating those that will exist during installation
  2. Submit not fewer than nine pieces of each type and finish of framing members and each type, class, kind, condition, and form of glazing as well as one sample of each glazing accessory (gaskets, tape sealants, setting blocks, and spacers).
  3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
  4. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
  5. Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.
- G. Product Options: Information on Drawings and in Specifications establishes requirements for assemblies' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including testing conducted by an independent testing agency and in-service performance.
1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

- H. Fire-Test-Response Characteristics: Where fire-test-response characteristics are indicated for assemblies and components, provide products identical to those tested per test method indicated by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- I. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Section 01 31 50, Project Meetings.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Protect materials during delivery, storage and handling to comply with manufacturer's directions and as required to prevent scratching and damage from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.
- B. Deliver Materials to site in manufacturer's original, unopened containers and packaging with labels clearly identifying product name, manufacturer and location of installation.

#### 1.09 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation or other causes.
  - 1. Install liquid sealants at ambient and substrate temperatures above 40 degrees Fahrenheit
  - 2. Do not install polycarbonate units when ambient and substrate conditions are above 80 degrees Fahrenheit or below 40 degrees Fahrenheit.
- B. Field Measurements: Indicate measurements on Shop Drawings.

#### 1.10 WARRANTY

- A. General: Warranties shall be in addition to, and not a limitation of, other rights the Authority may have under the Contract Documents.
- B. Warranty Period: Manufacturer's standard but not less than ten (10) years after date of Final Acceptance.

- C. Special Assembly Warranty: Manufacturer's standard form in which manufacturer and Installer agree to repair or replace components of assemblies that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
    - a. Structural failures including, but not limited to, excessive deflection.
    - b. Deterioration of metals and other materials beyond normal weathering.
    - c. Water leakage.
    - d. Thermal stresses transferred to supporting structure.
    - e. Noise or vibration created by wind, thermal and structural movements.
    - f. Loosening or weakening of fasteners, attachments and other components
  2. Warranty Period: Ten years from date of Substantial Completion.
- D. Manufacturer's Special Warranty on Polycarbonate Sheet: Written warranty, made out to the Authority and signed by manufacturer agreeing to furnish replacements for polycarbonate sheet units that deteriorate (as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site), break or develop defects from normal use that are attributed to manufacturing or installation process and not to practices for maintaining and cleaning products contrary to manufacturer's written instructions.
1. Defects include, but are not limited to, the following:
    - a. Delamination.
    - b. Color changes from original in excess of 3.0 units Delta E when measured per ASTM D 2244.
    - c. Losses in light transmission beyond 6 percent from original when measured per ASTM D 1003.
  2. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Basis-of-Design Manufacturer: The design for translucent polycarbonate panel skylight assemblies is based on Series 2500 base plate and low profile pressure cap system glazed with 20mm polycarbonate structured sheet by Duo-Gard Industries Inc. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
1. Duo-Gard Industries, Inc.: Series 2500, 20mm thick polycarbonate panel
  2. CPI Daylighting: Translucent Panel Canopy Systems.
  3. Wasco Products, Inc.: Standing Seam Polycarbonate Skylights.
  4. Super Sky Products Inc.: Single Slope Translucent Skylight Systems
  5. Note: Glass fiber reinforced thermo-set resin faces are not acceptable.

### 2.02 STRUCTURED POLYCARBONATE PANELS

- A. General: Translucent, extruded-polycarbonate sheet with cellular cross section that provides isolated airspaces and that is coextruded with a UV-protective layer.
1. Plastic Self-Ignition Temperature: 650 deg F or more per ASTM D 1929.
  2. Burning Extent: 1 inch or less per ASTM D 635.
  3. Burning Rate: 2.5 in/.min. or less per ASTM D 635.
  4. Smoke-Developed Index: 450 or less per ASTM E 84, or 75 or less per ASTM D 2843.
  5. Flame-Spread Index: Not more than 25 per ASTM E 84.
  6. Exterior-Fire-Exposure Class: Class A per ASTM E 108 or UL 790.
  7. Color: Blue or as selected by the Authority from the Manufacturer's full range.
- B. Color Stability: Not more than 3.0 units Delta E when measured according to ASTM D 2244 after outdoor weathering according to procedures in ASTM D 1435.
1. Outdoor Weathering Conditions: 120 months in a moderate North American climate.
  2. UV stabilization both sides of sheet.
- C. Impact Resistance: No failure at impact of 200 ft. x lbf according to free-falling-ball impact test using a 3-1/2-inch diameter, 6.3-lb ball.



## 2.03 ALUMINUM FRAMING SYSTEM

- A. Aluminum: Alloy and temper recommended in writing by manufacturer for type of use and finish indicated.
  - 1. Sheet and Plate: ASTM B 209.
  - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
  - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
- B. Components: Manufacturer's standard extruded-aluminum members of thickness required and reinforced as required to support imposed loads.
- C. Exposed Flashing and Closures: Manufacturer's standard prefinished aluminum components not less than 0.060 inch thick.
- D. Framing Gaskets: Manufacturer's standard.
- E. Framing Sealants: As specified in Division 7 Section "Joint Sealants."
- F. Anchors, Fasteners, and Accessories: Manufacturer's standard, corrosion-resistant, non-staining, and non-bleeding; compatible with adjacent materials.
  - 1. At closures, retaining caps, or battens, use ASTM A 193, 300 series stainless-steel screws.
  - 2. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
  - 3. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended in writing by manufacturer.
- G. Framing System Fabrication:
  - 1. Fabricate components before finishing.
  - 2. Fabricate components that, when assembled, have the following characteristics:
    - a. Profiles that are sharp, straight, and free of defects or deformations.
    - b. Accurately fitted joints with ends coped or mitered.
    - c. Internal guttering systems or other means to drain water passing joints, condensation occurring within components, and moisture migrating within assembly to exterior.
  - 3. Fabricate sill closures with weep holes and for installation as continuous component.

4. Reinforce components as required to receive fastener threads.
5. Weld components in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

#### 2.04 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- C. Aluminum Finish:
  1. Manufacturer's standard clear anodized.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
  1. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. General:
  1. Comply with manufacturer's written instructions.
  2. Do not install damaged components.
  3. Fit joints between aluminum components to produce hairline joints free of burrs and distortion.
  4. Rigidly secure non-movement joints.
  5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
  6. Weld aluminum components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
  7. Seal joints watertight, unless otherwise indicated.

- B. Metal Protection: Where aluminum components will contact dissimilar materials, protect against galvanic action by painting contact surfaces with bituminous paint or by installing nonconductive spacers as recommended in writing by manufacturer for this purpose.
- C. Install continuous aluminum sill closures with weatherproof expansion joints and locked and sealed or welded corners. Locate weep holes at rafters.
- D. Install components to drain water passing joints, condensation occurring within aluminum members, and moisture migrating within assembly to exterior.
- H. Install components plumb and true in alignment with established lines and elevations.
- I. Erection Tolerances: Install assemblies to comply with the following maximum tolerances:
  - 1. Alignment: Limit offset from true alignment to 1/32 inch where surfaces abut in line, edge to edge, at corners, or where a reveal or protruding element separates aligned surfaces by less than 3 inches (76 mm); otherwise, limit offset to 1/8 inch.
  - 2. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/2 inch over total length

### 3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
  - 1. Water-Spray Test: Panel assemblies shall be tested according to AAMA 501.2 and shall not show evidence of water penetration.
- B. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare test and inspection reports.

END OF SECTION 08 90 00

SECTION 09 96 00  
HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes surface preparation and application of high-performance coating systems on the following substrates:
  - 1. Exterior Substrates:
    - a. Steel.
- B. Related Sections include the following:
  - 1. Division 08 Section "Translucent Canopy Roof".

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of finish-coat product indicated.
- C. Samples for Verification: For each type of coating system and in each color and gloss of finish coat indicated.
  - 1. Submit Samples on rigid backing, 8 inches square.
  - 2. Step coats on Samples to show each coat required for system.
  - 3. Label each coat of each Sample.
  - 4. Label each Sample for location and application area.
- D. Product List: For each product indicated. Cross-reference products to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules.

#### 1.04 QUALITY ASSURANCE

- A. Master Painters Institute (MPI) Standards:
  - 1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
  - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and coating systems indicated.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

#### 1.06 PROJECT CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F.
- B. Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

### PART 2 PRODUCTS

#### 2.01 HIGH-PERFORMANCE COATINGS, GENERAL

- A. Material Compatibility:
  - 1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. Provide products of same manufacturer for each coat in a coating system.
- B. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Anticorrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC content of not more than 250 g/L.
- C. Colors: As selected by Architect from manufacturer's full range.
- D. Cold-Curing Epoxy Primer: MPI #101.
  1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  2. Products: Subject to compliance with requirements, provide one of the following:
    - a. ICI Paints; Devoe High Performance Coatings, Universal Epoxy Primer, Devran 205, 205B2735/205C0910.
    - b. Sherwin-Williams Company; Industrial & Marine, Duraplate 235 Multi-Purpose Epoxy, B67W235.
    - c. Tower Paint; Dura Prime, 86850.
  3. VOC Content: Minimum Range of E1.

## 2.02 POLYURETHANE COATINGS

- A. Polyurethane, Two-Component, Pigmented, Gloss: MPI #72.
  1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  2. Products: Subject to compliance with requirements, provide one of the following:
    - a. Benjamin Moore & Co.; Aliphatic Acrylic Urethane Gloss, CM74/M75.
    - b. ICI Paints; Devoe High Performance Coatings, Aliphatic Urethane Gloss Enamel, 389, 389BXXXX/389C0910.
    - c. PPG Architectural Finishes, Inc.; Pitthane, Urethane Aliphatic Pigmented Gloss, 95-850.
    - d. Tower Paint; DuraGloss, 8740 Series.
  3. VOC Content: Minimum Range of E1.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
  - 1. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
  - 2. Coating application indicates acceptance of surfaces and conditions.

3.02 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Steel Substrates: Remove rust and loose mill scale.
  - 1. Clean using methods recommended in writing by coating manufacturer.

3.03 APPLICATION

- A. Shop-apply surface prep and high-performance primer coatings, and field touch up primer and field apply top coat according to manufacturer's written instructions.
  - 1. Use applicators and techniques suited for coating and substrate indicated.
- B. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.04 CLEANING AND PROTECTION

- A. At the end of each workday, remove rubbish, empty cans, rags, and other discarded materials from the Project Site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

- C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.05 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

- A. Steel Substrates:
  - 1. Polyurethane, Pigmented, Over Epoxy Coating System:
    - a. Prime Coat: Cold-curing epoxy primer, MPI #101.
    - b. Topcoat: Polyurethane, two-component, pigmented, gloss, MPI #72.

END OF SECTION 09 96 00



SECTION 11 24 24  
ACCESS SUPPORT AND  
FALL RESTRAINT EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A Drawings and general provisions of Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Horizontal fall restraint cable system including:
  - a. System design
  - b. Cable
  - c. Intermediate pass-thru anchors
  - d. Terminating anchors
  - e. Energy absorber

B. Related Sections

1. Division 5 Section "Structural Steel Framing" for new steel framing for anchors and davit bases.
2. Division 7 Section "Joint Sealants" for related sealants.

1.3 REFERENCES

A. Publications listed herein are part of this specification to extent referenced.

1. American Institute of Steel Construction (AISC)
  - a. AISC Publication Load and Resistance Factor Design for Structural Steel Buildings
  - b. AISC Specifications for the Design of Cold-Formed Steel Structural Members
2. American Society for Testing and Materials (ASTM)
  - a. ASTM A36 Specification for Structural Steel
  - b. ASTM A123 Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Hardware

- c. ASTM A500 Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
  - d. ASTM A780 Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
  - e. ASTM B209-04 Specification for Aluminum and Aluminum-Alloy Sheet and Plate
  - f. ASTM B221-02 Specification for Aluminum and Aluminum-Alloy Extruded Bars, Wire, Shapes, and Tubes
  - g. ASTM B308/B308M-02 Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles
3. American Welding Society (AWS)
- a. AWS D1.1 Structural Welding Code
4. Occupational Safety and Health Standards
- a. ANSI/IWCA I-14.1-2001 Window Cleaning Safety
  - b. 1910 Subpart D (Walking and Working Surfaces)
  - c. 1910.66 Appendix C (Personal Fall Arrest)
  - d. 1910.66 Subpart F (Powered Platforms)
  - e. OSHA procedures and precautions for employees using descent control equipment.

#### 1.4 SYSTEM DESCRIPTION

##### A. Anchorage Design Requirements

- 1. Safety anchor system design shall comply with current OSHA, ANSI, and local regulations pertaining to window cleaning and fall protection in accordance with sections 1.1, 1.2, and 1.3.
- 2. Anchor system shall provide independent fall arrest anchorages in addition to suspension line anchorages for each descent location as required by OSHA and ANSI requirements.
- 3. System shall be designed to be compatible with current window cleaning industry standard equipment (examples: rope descent systems, boatswain chairs, swing stages, transportable suspension devices).
- 4. Structural design requirements of anchorages and tie-back
  - a. Anchorage shall be capable of sustaining a minimum ultimate load of 5,000 lbs., in any direction the load may be applied, without fracture or failure.
  - b. Anchorage shall be capable of sustaining a minimum proof load of 2,500 lbs., in any direction the load may be applied, without permanent deformation or damage to anchorage.

- c. Anchorages shall be designed with a minimum 1,250 lb. working load, in any direction the load may be applied.
  - e. Parapet or guardrails subject to direct loading by workers' ropes, cables, or other equipment shall be designed to withstand 1,800 lbs without damage to either the structure or the rigging component in contact with it.
5. Locate primary support and fall arrest anchors in conjunction with areas on façade of building needing to be serviced. Consideration shall be given to the type of suspension equipment that will be used at the building and conditions such as workers' reach, rigging methods, and roof edge conditions. Anchorages shall be unobstructed and located behind and in line with equipment or portion of building they are intended to service.

B. Horizontal fall restraint cable system

1. The Horizontal fall restraint cable system (HFRCS) shall allow up to two users to traverse the length of the cable span, each using a single lanyard for traveling along the cable spans. Turns in the HFRCS will require a double lanyard. The HFRCS shall be designed for two users using an energy absorbing lanyard, which limits the force applied to the HFRCS to 900 lb. or less.
2. HFRCS spans shall not exceed 100 feet long.
3. The horizontal line shall be constructed of 3/8" x 7 x 19 stainless steel or galvanized aircraft cable, commercial grade per specification SD 118 and Fed. Spec. RR-W-410, construction grade, with an average breaking strength of not less than 14,400 lbs.
4. Horizontal lines shall be permanently attached to anchors with 2 non-corrosive permanently swaged fittings swaged to manufacturer's specifications at each termination. Swages shall be verified not to loosen under load. Load capacity of one swage shall exceed strength of wire rope.
5. Horizontal lines must be attached to anchorages designed to be capable of supporting a minimum 5,000 lb. However, the HFRCS cable and anchorages shall be independent of anchorages used for suspension in accordance with Section 1.4(A) Anchorage Design Requirements.

1.5 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product proposed

1. Test report certified by a professional engineer
2. General product data
3. Detailed drawings of equipment proposed
4. Installation instructions

B. Shop Drawings

61. Submit scaled shop drawings showing location plan of all support equipment and sections detailing all parts and accessories.
62. Clearly specify equipment dimensions, materials, fabrication details, hardware, and installation instructions.
63. Include notes with guidelines of proper use of system.
64. Equipment location plan to include identification number next to each piece of equipment, i.e. (anchors and davits) that are permanently affixed to a structure.
65. Field welds shall be indicated on equipment details using AWS symbols and showing length and size. Auxiliary views shall be shown to clarify welding as required.
66. Shop drawings shall be prepared under supervision of a registered professional engineer and shall bear the engineer's seal and signature. Professional engineer shall be licensed in jurisdiction where project is located. Include P.E. certified report of tested equipment.

C. Quality Assurance Submittal Certificates

1. Provide documentation verifying company's amount of experience and successful performance in design, fabrication, and installation of permanent window washing equipment.
2. Submit listing of company's installations representing similar scope and complexity to project requirements for previous 10 years. List shall include information as follows:
  - a. Project name and address
  - b. Name of owner
  - c. Name of contractor
  - d. Name of architect (if applicable)
  - e. Date of completion
3. Provide documentation verifying that installers have been trained by the manufacturer and are competent.

D. Contract Close-out Submittals

1. Operation and Maintenance
  - a. Provide a safety inspection logbook for yearly inspections. Log book shall include a certification of compliance letter. The certification of compliance shall state that access system is in compliance with current OSHA regulations and ANSI/IWCA I-14.1-2001 Window Cleaning Safety Standard.

2. Project Record Document Data

- a. Record anchor locations and details.
- b. Submit 2 copies of a reduced, plastic laminated Project Record Drawing showing as-installed anchor locations, details, and instructional text in English (and Spanish upon request). Post one copy on interior of each roof door or adjacent to exit on roof; owner shall establish exact location.
- c. Submit a letter of certification by a registered professional engineer licensed in jurisdiction where project is located verifying that installed anchors and system are in compliance with OSHA and ANSI requirements as specified. Each piece of access equipment dedicated to the building shall be tested on site under the supervision of a P.E. in accordance with ANSI/IWCA I-14.1-2001 Window Cleaning Safety and Summit Anchor Co. test procedures.

1.6 QUALITY ASSURANCE

A. Qualifications

1. Provide products from a company specializing in design, fabrication, and installation of permanent window washing equipment with a minimum of 5 years documented experience. Companies like miscellaneous metal fabricators not normally engaged in design and fabrications of suspended access equipment are not acceptable.
2. Manufacturer and installer shall have specific liability insurance (products and completed operations) in an amount not less than \$5,000,000.
3. Installer(s) shall be trained or qualified by manufacturer in installation techniques and procedures of permanent window washing equipment and shall demonstrate a minimum of 5 years successful experience in such installation.

B. Regulatory Requirements

1. Comply with Occupational Health and Safety Standards:
  - a. ANSI/IWCA I-14.1-2001 Window Cleaning Safety Standard
  - b. 1910 Subpart D (Walking and Working Surfaces)
  - c. 1910.66 Appendix C (Personal Fall Arrest)
  - d. 1910.66 Subpart F (Powered Platforms)
  - e. OSHA Procedures and precautions for employees using descent control equipment.

2. Welding shall comply with AWS D1.1 and shall be performed by welders qualified to work in jurisdiction where project is located.
3. Comply with AISC publications:
  - a. Load and Resistance Factor Design for Structural Steel Buildings
  - b. Specifications for the Design of Cold-Formed Steel Structural Members

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original unopened packaging.
- B. Storage and Protection
  1. Store materials in a protected area away from construction activities.
  2. Clean bolts that have become dirty before installing.
  3. Special care must be taken with stainless steel since not compatible with many chemicals and materials.
  4. Do not install damaged materials. Remove damaged materials from site.

#### 1.8 SEQUENCING AND COORDINATION

- A. General contractor is responsible for coordinating the schedule for producing shop drawings, fabricating suspended access equipment, and installation. General contractor shall allow three weeks for delivery of shop drawings and three weeks to deliver equipment upon approval of shop drawing by general contractor.
- B. Manufacturer to provide detailed installation instructions and directions for installation of embedded items, welded items, and through-bolted items, etc.
- C. Manufacturer to provide installation assistance during installation of the equipment. However, the responsibility of the installation rest with the general contractor unless equipment is installed and certified by the manufacturer.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS & INSTALLERS

- A. Basis of Design Product: Subject to compliance with requirements, provide suspended access and fall restraint systems as manufactured by Summit Anchor Company or comparable product by one of the following:
1. American Davit and Anchor
  2. Pro-Bel Enterprises, Ltd.

### 2.2 STRUCTURAL COMPONENTS' MATERIALS

- A. Exposed Structural Components Finish: Galvanized Mild Steel or Stainless Steel
1. Steel: ASTM A572 GR 50
  2. Steel: ASTM A A36
  3. Galvanizing: ASTM A123
  4. Stainless Steel; 304 ASTM A 193 Grade B8, Class 2
  5. Aluminum; 6061-T6 Alloy
- B. Yield Strength
1. Base Plates and Bottom Plates, High Strength Steel: 50 ksi minimum
  2. Other Sections: 36 ksi minimum
- C. Non-Structural Components
1. Aluminum; 6061-T6 Alloy
  2. Alloys shall conform to requirements published in AA Aluminum Standards.
  3. Sheet and Plate: ASTM B209
  4. Extruded Bars, Rods, Shapes, and Tubes: ASTM B221
- D. Cold-Rolled Sections
1. ASTM A500
  2. Yield Strength: 55 ksi minimum
  3. Tensile Strength: 62 ksi minimum
- E. Nuts, Bolts, Davit Pins, and Washers
1. Stainless Steel; 304 ASTM A 193 Grade B8 or F593C
  2. Galvanized Flat Washers ASTM F-436 or 18 -8 Stainless Steel

- F. Anchor Bolts (for securing base plate)
  - 1. Metal: Stainless Steel, 304 Stainless Steel; ASTM A 193 Grade 8, B8
  - 2. Size: 5/8 in. diameter minimum

## 2.3 MANUFACTURED UNITS

- A. Anchor
  - 1. Capable of withstanding 5000 lbs. (2268kg) in any direction without permanent deflection.
  - 2. Anchor eye size: Not less than ¾ inch (20 mm) diameter material with 2 ¼ in (60 mm) eye opening.
  - 3. Anchor eye metals:
    - a. Forged, 1030 quenched and tempered per ASTM 576-90-b, 72ksi minimum
    - b. Stainless steel, type 304, solution annealed, 35 ksi minimum
  - 4. Anchor tube height: not less than 4 in. above the finished roof.
- B. Davit Base
  - 1. Stanchion type complete with davit adapter and lock pin with stainless steel safety snap pin.
  - 2. Davit socket; with two stainless steel hinge pins and stainless steel safety snap pins.
  - 3. Pier Height: not less than 10 in. above finished roof surface to allow proper fit up with adaptor.
- C. Cable system
  - 1. Install complete with inline shock absorber to limit load to 2,250 lbs. or less at terminating anchors.
  - 2. Pass through cable anchors to allow up to two workers to traverse straight cable runs with single lanyard without detachment off lanyard.
- D. Flashing – verify compatibility with roofing system
  - 1. Seamless Spun Aluminum Flashing: ASTM B221; Type 6061-T6 alloy
  - 2. Stainless Steel: 304



## 2.4 FABRICATION

- A. Fabricate work true to dimension, square, plumb, level, and free from distortion or defects detrimental to appearance and performance.
- B. Grind off surplus welding material to ensure exposed surfaces are smooth so as not to abrade workers' ropes.
- C. Welding shall be in accordance with the AWS Structural Welding Code D1.1/D1.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Site Verification of Conditions
  - 1. Examine areas and conditions under which permanent window washing equipment shall be installed.
  - 2. Report to general contractor any conditions that deviate from shop drawings or any defects in workmanship that would cause an unsafe installation. This report shall be verified in writing to the general contractor and any other responsible party.
  - 3. Correct conditions detrimental to timely and proper execution of work.
  - 4. Do not proceed until unsatisfactory conditions have been corrected.
  - 5. Commencement of installation constitutes acceptance of conditions and responsibility for satisfactory performance by installer.
  - 6. Faults occurring in work of this section due to acceptance of unsatisfactory conditions shall be corrected at no additional cost to owner.

### 3.2 INSTALLATION

- A. General Requirements
  - 1. Coordinate anchor installation with roofing installation to ensure a watertight and warrantable condition of the roofing. Anchors shall be directly flashed into roofing in a manner compatible with roofing system and anchors.
  - 2. When components come into contact with dissimilar metals, surfaces shall be kept from direct contact to prevent corrosion.
  - 3. No wall anchors shall be installed through membrane roofing system without specification detailing such from the architect or water proofing company warranting the roof.

4. Deform a minimum of two threads of tail end of anchor studs after nuts have been tightened to prevent accidental removal or vandalism. Deform threads with 2/32" stainless steel punch

B. Instructions for welding access equipment to structure

1. All welders must be certified to American Welding Society (AWS) in accordance with AWS standards.
2. Welding rods used to weld the anchor system to be E70 xx electrodes.
3. Prior to welding anchors to structure, abrasively remove within one inch of all welded surfaces galvanizing, mill, scale, and rust.
4. Immediately after welding, chip away slag to prepare for welding inspector to inspect welds.
5. An AWS certified welding inspector must inspect and confirm size of all field welds. Following the inspection a written report must be supplied to the building owner and/or general contractor. Welded joints shall not be painted until after welding has been completed and the weld accepted.
6. Immediately after an acceptable inspection, paint welded areas with cold-galvanizing compound to protect from corrosion.
7. Structural steel to receive roof or wall anchors shall have a surface wide enough so that base plate can be welded all the way around. For example, anchors equipped with 4½ in. (112.5 mm) base plates would require a minimum 5 in. (137.5 mm) surface to weld to.

D. Aluminum Flashing

1. Deck flange shall be flashed in compliance with National Roofing Contractor Association recommendations.

3.3 REPAIR/RESTORATION

A. Galvanizing Touch-Up

1. Immediately after erection clean field welds and abraded areas. Repair damaged areas in compliance with ASTM A780.

3.4 FIELD QUALITY CONTROL

A. Inspection and site visits

6. Inspections and site visits shall be performed while installation of equipment is in progress under the supervision qualified professional engineer registered in the jurisdiction where the project is located.

7. On-site inspection of equipment welded to structure shall be performed by an AWS Certified Welding Inspector verifying, in writing, size and quality of welds. Such an inspection shall be performed on each piece of equipment before roofing material is installed.
8. On-site inspection shall be performed on all cast in place items while being tied in with the rebar with sufficient time before concrete is poured to allow to adjustments to embedded items as recommended by inspector.
9. G.C. shall be responsible to schedule above site visits and inspections with sufficient advanced notice given to the inspection company.

B. Site Tests

- a All equipment shall be tested on site in accordance with manufacturer's recommendations, under the supervision of a professional engineer, and ANSI/IWCA I-14.1-2001 Window Cleaning Safety Standards, before being placed in service.
- b Equipment shall be tested under the supervision of a professional engineer with experience with suspended maintenance equipment and manufacturers guidelines.

- C. Manufacturer shall assist and/or supervise installation of window washing equipment installed by others when such is included in contracted.

3.5 ADJUSTING

- A. Verify that completed work has been installed correctly and products function properly. Make adjustments where needed to ensure satisfactory operation.
- B. Complete inspection logbook to certify system for use noting any deviations, changes, or corrections from original shop drawings. Provide as-built anchor layout plan on 11 in. x 17 in. paper or larger together with annual inspection log book.

END OF SECTION 11 24 24

SECTION 22 40 00  
PLUMBING

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, material, equipment, and services necessary to furnish and install PLUMBING at the location(s) shown on the Drawings and/or as specified herein.
- B. The plumbing work includes but is not limited to the following:
  - 1. Pipe and pipe fittings, valves.
  - 2. Plumbing Specialties: Floor and roof drains, cleanouts, etc.
  - 3. Piping and equipment insulation.
  - 4. Hangers, sleeves, accessories, etc.
  - 5. Plumbing permits.
  - 6. Testing.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.03 RELATED WORK

- A. Sections that may contain information that relates to this section includes, but is not limited to, the following:
  - 1. Plumbing Basic Materials and Methods.
  - 2. Division 26 Sections, Electrical.
  - 3. Site Utilities.

1.04 REFERENCES

- A. General: The work shall comply with or exceed the referenced standards and codes. Any work which cannot meet the referenced standards and codes shall be brought to the attention of the Authority for written approval before proceeding with the work.
- B. Codes: The work shall comply with the following codes:
  - 1. City of Chicago Building Code.
  - 2. State of Illinois Plumbing Code.

- C. Standards: The work shall comply with the following standards:
1. American National Standard Institute (ANSI)
  2. American Society of Mechanical Engineers (ASME):
    - a. ASME/ANSI Sec. 9 - Welding and Brazing Qualifications.
    - b. ASME/ANSI B16.1 - Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250, and 800.
    - c. ASME/ANSI B16.3 - Galvanized Malleable Iron Threaded Fittings.
    - d. ASME/ANSI B16.4 - Cast Iron Threaded Fittings Class 125 and 250.
    - e. ASME/ANSI B16.18 - Cast Copper Alloy Solder-Joint Pressure Fittings.
    - f. ASME/ANSI B16.12 - Cast Iron Threaded Drainage Fittings.
    - g. ASME/ANSI B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings.
    - h. ASME/ANSI B16.26 - Cast Bronze Fittings for Flared Copper Tubes.
    - i. ASME/ANSI B16.39 - Malleable Iron Threaded Pipe Unions.
    - j. ASME/ANSI B31.9 - Building Service Piping.
  5. American Society of Testing and Materials (ASTM):
    - a. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
    - b. ASTM A74 - Cast Iron Soil Pipe and Fittings.
  6. American Water Works Association (AWWA):
- D. Conflicts: In all cases where conflicts exist in standards or codes, the more stringent requirement shall be followed. Where the Contract Documents are in excess of the referenced codes and standards, the Contract Documents shall be followed. All conflicts shall be brought to the attention of the Authority for written approval before proceeding with the work in question.

#### 1.05 SUBMITTALS

- A. The Contractor shall furnish shop drawings, product data and samples in accordance with the requirements of the Division One Section, "Submittals" and as required below:
1. Shop Drawings of piping floor layouts in plan drawn to a minimum scale of 1/8" = 1'-0".
  2. Drainage Diagrams showing pipe sizes, provision for expansion, cleanouts, etc.

- B. Product Data: Submit for Authority's review, manufacturer's literature indicating installation instructions and dimensions, materials, accessories, performance information, certified performance curves, rated capacities, electrical requirements and wiring diagrams, standards listing, certification and guarantees for the following:
1. Piping, tubing, fittings and couplings.
  2. Joints and materials.
  3. Hangers and supports.
  4. Flashing and clamping flanges.
  5. Cleanouts.
  6. Stops, strainers, traps, supplies and escutcheons.
- C. Product data submitted shall include specifications section and paragraph reference with intended use clearly indicated. A submittal shall be made for review and approval for all items; even if already identified herein by manufacturer's model number.
- D. Test and Inspection Reports: Furnish within five (5) days of each test or inspection of any piping segment, equipment device, or system. Include all relevant information concerning the test or inspection, as provided in the format specified, including Contractor's Material and Test Certificates for the following item:
1. Pressure Testing of Piping.
- E. The Contractor shall furnish operating instructions and maintenance recommendations and requirements in accordance with the requirements of Division One Section, Project Closeout.
- F. Certificates: Welding Certificate.
- G. Manufacturer List: Contractor shall forward to the Authority for preliminary review, a complete list of manufacturers of all material and equipment proposed to be incorporated into the work. The review of the list by the Authority shall be considered tentative and is further subject to submission and final review of shop drawings, catalog cuts, etc.
- H. Warranties: Submit copies of warranties for major components including water heaters, water coolers, plumbing fixtures, faucet assemblies, etc.

1.06 QUALITY ASSURANCE

- A. General: All materials shall be clearly stamped or tagged as required by the referenced standards. Any materials or workmanship which in the opinion of the Authority does not use the referenced standards and codes shall be discarded and replaced at the Contractor's expense.
- B. Authority's Review: No portion of any work shall commence until review of shop drawings and other submittals for that portion of the work has been completed and returned to the Contractor marked "Approved". All work shall be in accordance with and constructed from documents bearing the Authority's stamp of review.
- C. Manufacturer Qualifications: Subject to conformance with the requirements of the Contract Documents, the Contractor shall furnish plumbing materials and equipment manufactured by a company specializing in manufacturing the products specified in this section with a minimum of five (5) years documented experience.
- D. Installer Qualifications: Subject to conformance with the requirements of the Contract Documents, plumbing shall be installed by a company specializing in performing the work of the Section with a minimum of five (5) years documented experience.
- E. Regulatory Requirements: City of Chicago Plumbing Code. All new plumbing fixtures to meet ADA codes and requirements.
- F. Welding: Qualifying welding procedures, welders and operators in accordance with ASME B31.9, as applicable, for shop and project site welding of pipe work. Certify welding of piping work using Standard Procedure Specifications by, and welders tested under supervision of, National Certified Pipe Welding Bureau (NCPWB).
- G. Code Ratings, labels or other data which are die-stamped or otherwise affixed to the surface of the equipment shall be in visible location.

1.07 SEQUENCING/SCHEDULING

- A. The Contractor shall schedule and perform tasks required for furnishing and installing the plumbing in conformance with the requirements of the accepted project schedule.
- B. Coordinate the installation of downspouts, flashing, and roof penetrations.

- C. Coordinate the installation of drains in poured-in-place concrete slabs, to include proper drain elevations, installation of flashing, and slope of slab to drains.
- D. Coordinate the installation of storm sewer systems as necessary to interface building drains with drainage piping systems.

#### 1.08 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Store products in manufacturer's original shipping containers. Do not stack containers or store in such a manner that may cause damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

### PART 2 PRODUCTS

#### 2.01 ABOVE GROUND DRAINAGE PIPE AND FITTINGS

- A. Schedule 40 galvanized steel seamless pipe, ASTM A53, with 150 lbs. malleable iron threaded, galvanized and banded fittings, ANSI B16.3, for 2 inch and smaller waste and vent piping, all aboveground downspouts and sump pump discharge.
- B. Flanges: ASTM A106 galvanized. ANSI Class 150.
- C. Cast-Iron Soil Pipe: ASTM A74, Service weight, hub and spigot coated soil pipe and fittings, for 3 inch and larger sanitary drainage and vent pipe.
  - 1. Lead and Oakum Joints.

#### 2.02

- A. End Connections:
  - 1. Threads: Comply with ANSI B2.1, steel pipe connection 2 inch and smaller.
  - 2. Flanges: Comply with ANSI B16.1 for cast iron, ANSI B16.5 for steel, and ANSI B16.24 for bronze valves, steel pipe connection 2 1/2 inch and larger.
  - 3. Solder Joint: Comply with ANSI B16.22, copper tube connection.



- a. Caution: Where soldered end connections are used, use solder having a melting point below 840 degrees F for gate, globe and check valves; below 421 degrees F for ball valves.
- b. The use of filler material with lead content is prohibited.

## 2.12 DRAINAGE FITTINGS

- A. General: Provide drainage fittings as indicated on the drawings and as hereinafter specified. Provide flashing flange with each drain and a clamping device where drain bodies pass through a waterproof membrane. Connection sizes of drainage fittings shall be as indicated in the drawings.
- B. Flashing Clamping Flanges: Provide cast iron clamping flange fittings with caulking ring on all piping where same pierces water proofing membrane:
  1. Manufacturers:
    - a. Jay R. Smith #1760
    - b. Josam #26420
    - c. Zurn.
    - d. Approved Equal.
- C. Cleanouts (CO): Provide cast bronze, taper threads, counter sunk type cleanout plugs where shown on drawings and as required by Local Codes. Furnish access body assemblies for all cleanouts located in floors, and stainless steel shallow cover for all cleanouts located behind finished walls.
  1. Cleanout Plugs: Cleanout Plugs shall be cast bronze taper thread countersunk type, complying with ANSI B2.1.
    - a. Jay R. Smith, 4470
    - b. Josam, 58540
    - c. Zurn, ZARB-1470
    - d. Approved Equal.
  2. Cleanouts - Threaded Seal - Finished Floors: Cleanouts with cast iron body and frame, flashing flange round adjustable scoriated nickel-bronze top and tapered thread bronze plug. Secured cover with vandal proof screws:
    - a. Jay R. Smith, 4028-F-U-PB
    - b. Josam, 56000-16-22-F
    - c. Zurn
    - d. Approved Equal.

3. Cleanouts - Threaded Seal - Unfinished Floors: Cleanouts with cast iron body and frame, round adjustable scoriated cast iron top with non-tilt tractor cover and vandal proof screws.
  - a. Jay R. Smith, 4248-U
  - b. Josam, 56040
  - c. Zurn, Z-1402-VP
  - d. Approved Equal.
  
4. Wall Cleanouts Finished Walls (WCO); Cleanouts with cast iron calk ferrule, cast bronze countersunk plug and stainless steel shallow cover with screw:
  - a. Jay R. Smith, 4422
  - b. Josam, 58710-15-22
  - c. Zurn, ZN-1446-BP
  - d. Approved Equal.

#### 2.23 PIPE HANGERS AND SUPPORTS

- A. Provide adjustable hangers, inserts, brackets, rolls, clamps, supplementary steel, and other devices required for proper support of all pipe lines. Hangers shall be designed to allow for expansion and contraction of pipe lines, and shall be of adequate size to permit covering to run continuously through hangers. Piping at pumps, tanks, and other items of equipment shall be supported independently so that no weight shall be supported by the equipment.
- B. All non-copper hangers and supports, including rods which are not plated, shall be furnished with shop coat of rust inhibiting primer; copper or copper plated hangers and supports shall be used wherever they touch bare copper tubing.
- C. Wire or strap hangers are not permitted.
- D. Pipe supports for beam and joist construction shall be beam clamps, B-Line Fig. B3054.

#### 2.24 PIPE SLEEVES AND ESCUTCHEONS

- A. Provide pipe sleeves for all pipes which pass through walls, partitions, floors, ceilings, or roofs.
- B. General floor sleeves shall be standard weight galvanized steel pipe with bottom end flush with surface, top end extend 1" above finished floor, caulked.

- C. Foundation walls and slabs on grade: Cast iron (per Clow 1430/1435 or Josam, Zurn, J.R. Smith or Wade), sleeves, flush inside and outside, integral waterstop, caulked, or Thunderline linkseal series "LS" sleeve with waterstop, rubber sealing elements, pressure plates and bolts.
- D. Concrete walls: Standard weight galvanized steel pipe, flush with wall surface at both ends anchored and caulked.
- G. Sleeves for uninsulated piping shall be two (2) sizes larger than pipe passing through. Sleeves for insulated piping shall be large enough to accommodate the full thickness of the pipe covering with clearance for expansion and contraction.
- H. Where pipes pass through floors on fill or concrete exterior walls, caulk sleeves with oakum and lead wool.

## PART 3 EXECUTION

### 3.01 GENERAL

- A. Provide and install all piping, fittings, equipment, fixtures, and accessories, as shown on the Contract Drawings, as required by the referenced standards and codes, as recommended by the manufacturer, and as specified for water, drainage, waste and vent systems.
- B. All piping shall be arranged and aligned in accordance with reviewed Shop Drawings. Install all piping straight and direct as possible, neatly spaced with risers and drops running plumb and true.
- C. Installation of piping shall be coordinated with other work. The Contractor shall carefully check the architectural, mechanical, structural, electrical and civil drawings for conflicts and interferences with his/her work.

### 3.02 EXAMINATION

- A. Verify all dimensions by field measurements. Verify that all piping may be installed in accordance with pertinent codes and regulations, the original design, and the referenced standards.
- B. Verify existing grades, inverts, utilities, obstacles, and topographical conditions prior to installations.
- D. Examine walls, floors, roof, and plumbing chases for suitable conditions where piping and specialties are to be installed.

- E. Do not proceed until unsatisfactory conditions have been corrected.

### 3.03 GENERAL PIPING INSTALLATION

- A. Full lengths of pipe shall be used wherever possible. Short lengths of pipe with couplings will not be permitted.
- B. All pipe shall be cut to exact measurement to be installed without forcing. After cutting, ends shall be reamed and cleaned to eliminate foreign matter and burrs.
- C. Cutting or other weakening of the building structure to facilitate piping installation will not be permitted.
- D. All pipe and fittings shall be marked by the manufacturer in accordance with the marking sections of the standards to which reference is made or in accordance with the requirements of MSS-S-5: Standard Marking System for Valves, fittings, Flanges and Unions of the Manufacturers Standardization Society of the Valve and Fittings Industry.
- E. Make all changes in size and direction of piping with manufactured fittings. Field fabricated fittings will not be allowed.
- F. Joints in threaded pipe installations shall be made tight without caulking or the use of lead or paint, and no lubricant shall be used except flake graphite and cylinder oil paste; Dixon's Compound or Key Paste, and the lubricant shall be applied to make threads only.
- G. Pipe sizes for all branches, stubs, etc., shall have a minimum size of  $\frac{3}{4}$  inch.
- H. In no case shall any pipe be installed where it is supported on, or suspended from, another pipe or the piping of other trades.
- I. All piping subject to expansion and contraction, at the time of installation, shall be cold sprung to allow in part for expansion.
- J. In all cases where pipe connections are made to piping or any item of equipment of dissimilar metal, provide the proper type of dielectric fitting; EPCO or Center Plastics insulated unions.

### 3.16 FIELD QUALITY CONTROL

#### A. Inspections:

1. Do not enclose, cover, or put into operation water, drainage and vent piping system until it has been inspected and approved by the authority having jurisdiction.
2. During the progress of the installation, notify the plumbing official having jurisdiction, at least 24 hours prior to the time such inspection shall be made. Perform tests specified by the City of Chicago Building Code in the presence of the plumbing official.
  - a. Final Inspection: Arrange for a final inspection by the plumbing official to observe the tests specified below and to insure compliance with the requirements of the plumbing code.
3. Reinspection: Whenever the plumbing official finds that the piping system will not pass the test or inspection, make the required corrections and arrange for reinspection by the plumbing official.
4. Reports: Prepare inspection reports, signed by the plumbing official.

#### B. Test drainage system as follows:

1. Test for leaks and defects all drainage and vent piping systems. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.
2. Leave uncovered and unconcealed all drainage and vent piping until it has been tested and approved. Expose all such work for testing, that has been covered or concealed before it has been tested and approved.
- 3.. Repair all leaks and defects using new materials and retest system or portion thereof until satisfactory results are obtained.
4. Prepare reports for all tests and required corrective action.

3.18 PROTECTION

- A. Protect drains during remainder of construction period, to avoid clogging with dirt and debris, and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of day or whenever work stops.
- C. Provide protective covering for installed fixtures, electric water coolers, and trim.
- D. Do not allow use of fixtures for temporary facilities unless expressly approved in writing by the Authority.

3.19 HEAT TRACING

- A. All water, waste and vent piping exposed to the cold weather shall be heat-traced as indicated on the Drawings.
- B. All heat traced piping shall be insulated and provided with a weatherproof jacket to protect the insulation.

3.20 CORROSION CONTROL

- A. All metallic piping passing from within the structure into the ground shall be fitted with two stage dielectric isolation couplings to prevent possible stray currents.

END OF SECTION 22 40 00

SECTION 23 83 30  
ELECTRIC HEAT TRACING SYSTEM

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the furnishing and installing of electric heat trace systems for protecting water pipes and drains from freezing.
- B. The Contractor shall furnish and install complete and functional heat trace systems including wiring; controls; thermostats; all electrical connections and any conduit, cable, boxes, outlets and other equipment and accessories required.
- C. Related work specified elsewhere:
  - 1. Section 22 25 00, Mechanical Insulation.

1.02 SUBMITTALS

- A. The Contractor shall prepare and submit, before fabrication and assembly of the heat trace system equipment, the following:
  - 1. Shop drawings showing the layout of each pipe line to be protected, equipment drawings showing the details of the wiring, thermostat, controls, connections, warning lights and alarms and control panels.
  - 3. Calculation data showing the electrical load data for each system.
  - 4. Product data, catalog cuts and specifications describing the electrical and physical characteristics of each item including the thermostat, controls warning lights and alarms and control panels.
  - 5. Installation instructions for the system.
- B. The Contractor shall submit, for record and distribution, prior to shipment of the equipment, five copies of Operation and Maintenance manuals for the heat trace system.
  - 1. Operation and Maintenance manuals shall include descriptive bulletins and operation leaflets for the thermostats, controls and warning lights and alarms.
    - a. Each Operation and Maintenance manual shall contain the "Record Document" Drawings, complete operating and instruction manuals, spare parts lists, certified test documents, and other special data required for this equipment.

2. Spare parts bulletins shall be included with catalog cuts for each item.
3. Certified test reports shall include all assembly and subassembly test and inspection reports.

## PART 2 PRODUCTS

### 2.01 GENERAL

- A. The Contractor shall furnish all necessary labor and tools, materials, and equipment and shall properly construct and connect the electric heat trace system in accordance with the manufacturer's directions and recommendations.
- B. The electric heat trace cable shall be either be covered with a protective nickel braid or covered with a tinned copper braid and a corrosion protective outer fluoropolymer jacket.
- C. The Contractor shall coordinate the design and installation of the heat trace system with the pipe insulation system.
- D. The design, selection and size of the heat trace cable shall be in accordance with correct heat transfer calculations as recommended by the equipment manufactures design guide.
- E. The system shall be controlled and monitored from a single control panel. The system shall be controlled from a thermostat with provisions for a manual override from a Hand-Off-Auto switch.
- F. Monitoring and alarm circuits shall be provided that monitor each heat trace circuit for current and continuity of the heat trace cable, and the entire system for low temperature failure.
- G. The electric heat trace cable, control panel, and accessories shall have UL, FM, or CSA system listing.

### 2.02 MATERIALS

- A. The Contractor shall furnish and install the electric heat trace system which shall include but not be limited to the electric heat trace cable, tape or banding, thermostats, control panel and warning lights and alarm.
- B. The electric heat trace system for freeze protection shall be controlled from a common ambient sensing thermostat set to activate the system at 40 degrees, and a parallel backup thermostat set at 40 degrees F. An alarm shall be provided to indicate the failure of either thermostat or lack of power.



- C. The control panel shall provide for the necessary controls and contactors plus an additional 25 percent spare space. The contactors shall be electrically operated, electrically held, 30 ampere, 600 Volt, 3 pole, with a 120 Volt control coil. The contactors shall be as manufactured by Allen Bradley or Square D.
- D. LED pilot lights shall be provided to indicate control power available, system on, off, and circuit on and failure alarms for each heat trace circuit.
- E. The system and all components shall be approved by the Authority.
- F. The cable shall be industrial type, rated 8 watts per foot (W/ft), at 120 volts, at a temperature of 50 degrees F. and a temperature identification number (T-rating) of T6 (185 degrees F. exposure). Values shall be established per Institute of Electrical and Electronics Engineers, Incorporated (IEEE) Standard 515, Testing, Design, Installation and Maintenance of Electrical Resistance Heat Tracing for Industrial Applications.
- G. The heating cable shall be self-regulating. The cable heat output shall decrease with raising ambient temperature without employment of an auxiliary electrical regulatory device.
- H. The heating cable shall be composed of two parallel 16 AWG (or larger) stranded, nickel-plated copper bus wires, embedded in a polymeric conductive (heat generative) core (web). The wires and core shall be enclosed within a tinned copper, braided shield, suitable for use as an electrical fault grounding conductor. All cable components shall be jacketed with a tough, abrasion and moisture resistant thermoplastic (e.g. polyolefin), inert with aqueous and cleaning chemicals. The overjacket shall provide corrosion protection for the cable. A polyolefin or fluoropolymer overjacket is an acceptable alternate.
- I. The cable shall have, monitor wires and a tinned copper braid, with a fluoropolymer jacket for mechanical and corrosion protection. The cable is suitable for direct placement on metallic and polyvinyl chloride (PVC) piping. The heat trace circuits shall be designed to operate on 20 ampere circuits.
- J. The heating cable shall be unaffected by exposure to non-hazardous, unshielded indoor and outdoor environmental conditions. The cable service life shall not be diminished by exposure to ultraviolet radiation and random fluctuating temperatures within the range of -30 degrees to 150 degrees F.
- K. The cable shall have a minimum expected service life of 10 years in applications of continuous operation. A minimum of 90% of the nominal rated power shall be exhibited following 1000 hours of continuous operation, in accordance with Underwriters Laboratories, Incorporated (UL) Standard 746B, Polymeric Materials – Long Term Property Evaluations.

- L. Heating cable shall be UL approved. Cable shall have original manufacturer's labeling.
- M. The heat trace system shall be as manufactured by Delta-Therm, Chemelex, Bylin or approved equal.

### PART 3 EXECUTION

#### 3.01 PREPARATION

- A. Heat tracing shall be installed on clean surfaces free of dirt, debris, protrusions, oil, grease and moisture. Remove existing insulation, if any, as required for proper installation of the heat trace cable. Remove existing heat trace system or components as required for installation of the new system or components.
- B. Locations for installation of the control panel, thermostat and warning light and alarm shall be approved by the Authority.

#### 3.02 INSTALLATION

- A. The heat trace cable shall be installed in such a manner as to maintain the best possible contact with the traced pipe, valves, flanges and other in-line equipment. The heat tracing cable shall be secured to the pipe as recommended by the heat trace system manufactures installation instructions.
- B. In order to allow for maintenance access to valves, strainers, and other in-line equipment where additional heat tracing is required, a loose loop of heating cable of the length required shall be left at the item to be traced. The loop shall be spiraled around the item and secured as recommended by the heat tracing system manufacture's installation instructions.
- C. All junction boxes, splices, and terminations requiring maintenance shall be mounted to be accessible without disturbing the insulation and jacket.
- D. The location of the ambient sensing thermostats shall be selected to obtain a representative temperature, be accessible for maintenance, and protected from tampering.
- E. The installation and final adjustments to the electrical heat tracing system shall be supervised and field tested by a qualified factory trained equipment manufactures service engineer.
- F. After field testing has been completed the installed heat trace system shall be covered with insulation and a jacket as specified in pipe insulation section of this Specification.

- G. All pipe electrically heat traced and insulated shall have a plastic label applied to the insulation every 25 feet. The plastic label shall read "Electric Heat Trace Circuit Number, Panel Number.
- H. Unless otherwise approved, cable of 1000 feet in length and shorter shall be furnished in one piece. Cable of greater lengths shall be furnished in increments of this length or longer.

### 3.03 ELECTRICAL CONNECTIONS

- A. Final electrical connections between the heat trace system and the power source and the energizing of the system will be performed by the Authority's electrical department unless directed and approved otherwise.

### 3.04 RE-INSULATION

- A. Re-insulate or insulate over the new heat trace cable after installation. See insulation specification. Type of insulation must be approved to be used with the heat trace cable to avoid fire and other hazards. Insulate according to manufacturer's directions. Take precautions to not damage the heat trace cable.

### 3.05 OPERATION AND MAINTENANCE MANUAL

- A. Upon completion, Contractor shall test system for proper operation and set controls.
- B. The equipment manufacturer and installer shall provide adequate training for the Authority's Personnel in the proper operation and maintenance of the equipment.
- C. The installer shall provide as built drawings indicating the location of heat tracing and location of connections, controls, thermostats and warning lights and alarms. The manufacturer shall provide final and complete operation and maintenance manuals for all components of the heat trace system.

END OF SECTION 23 83 30

SECTION 26 50 10  
LIGHTING FIXTURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and other Specification sections apply to this section.

1.02 SUMMARY

- A. This Section specifies the methods of construction and installation that apply to lighting fixtures, exit lights, emergency lights, motion sensor switches and accessories required for a complete interior and exterior lighting system at rapid transit stations.

- B. Related work specified elsewhere:

1.	Section 26 01 00	General Provisions
2.	Section 26 03 00	Electrical Demolition.
3.	Section 26 05 00	Raceways and Boxes.
4.	Section 26 10 00	Basic Electrical Materials and Methods
5.	Section 26 12 30	Wires, Cables, Splices, Terminations.
6.	Section 26 14 10	Wiring Devices.
7.	Section 26 17 00	Local Control
8.	Section 26 17 50	Local Control Panels
9.	Section 26 19 00	Grounding
10.	Section 26 19 50	Identification
11.	Section 26 47 00	Panelboards
12.	Section 26 95 00	Electrical Testing

- C. The Contractor shall furnish and install all lighting fixtures as shown on the Drawings and indicated on the light fixture schedule.
- D. All fixtures shall have UL label or listing.
- E. Fixture catalog numbers specify the standard of quality and appearance required and shall represent the basic fixture of that type. Substitutions to the listed acceptable manufactures will not be accepted until the contractor has complied with the requirements of Section 01 33 00, Submittal Procedures.
- F. Lamps, mounting brackets and mounting hardware for all fixtures shall be supplied by the Contractor.
- G. LED light sources and power supplies shall be supplied by the approved manufacturer.

## 1.03 WARRANTY

### A. Warranty Requirements for All Fixtures:

1. The fixture and all its components shall be warranted by the fixture manufacturer to be free from defects in material and workmanship for a period of one (1) year from the date of installation.
2. The Contractor shall agree to promptly correct by repair or replacement any defect or failure of compliance that may develop within one (1) year of the date of installation. Any part or material replaced under this warranty shall be warranted for additional one (1) year period from the date of replacement.
3. The Contractor's obligation shall include reimbursement to the Authority for any labor, material, transportation or reinstallation costs incurred by the Authority in making any correction assented to by the Contractor.

### B. Additional Warranty Requirements for LED Fixtures:

1. The lamps and driver components (RoHS compliant) of LED fixtures shall be additionally warranted by the manufacturer for a period of five (5) years against defects in materials and workmanship that result in a fixture lumen depreciation of 30 percent or greater.

## PART 2 PRODUCTS

### 2.01 GENERAL REQUIREMENTS

- A. The Contractor shall furnish and install all lighting fixtures in strict accordance with the Lighting Fixture Schedule or Lighting Fixture Details as described hereunder or on the Drawings. Fixtures shall be complete with all necessary accessories and related work including lamp holders, lamps, ballasts/LED power supplies, starters, LED light sources, prismatic style lens, frames, support, wiring and all connections. The Contractor shall provide supports from framework where no finished ceiling occurs.
- B. The Contractor shall provide auxiliary supports for mounting fixtures in areas without ceilings (i.e. exposed beams and joists) as may be required for proper installation of fixtures. Such supports shall span a minimum of 2 joists for each individual fixture, and shall be securely and suitable anchored to same. Fixtures shall not be supported from underside of roof deck or built tees except as specifically noted otherwise on the Drawings, the detail shall be followed.
- C. Fixtures shall bear the Underwriter's Laboratories labels and shall be purchased, wired and installed in accordance with regulations applicable to the CEC.

- D. The Contractor shall provide adequate protection for fixtures and at completion of the work they shall be clean and free of foreign material. Replace all burned out or defective lamps, starters, etc., until such time as the Authority takes complete occupancy of the facility.
- E. All material furnished under this contract shall be new and of the best quality practicable for the application.
- F. All fixtures shall be constructed to be sturdy and rigid. Fixtures located in public areas at a mounting height of ten feet or less shall be designed to be vandal resistant.
- G. Fixtures and all components shall be constructed, assembled and fastened for maximum endurance to the vibration present on CTA platforms.
- H. Fixtures shall have simple lines and a clean uncluttered appearance. There shall be a minimum of exposed hardware.
- I. The fixture shall be so constructed, hinged and latched that relamping, ballast replacement, power supply replacement, and LED light source component replacement can be performed safely by one individual from a centrally located ladder, without requiring relocation of the ladder.
- J. Fixtures shall be designed and tested to maintain the temperature of all interior components (ballasts, lamps, gaskets, diffusers, etc.) below their respective
- I. manufacturers recommended normal operating temperature, for any predictable electrical or environmental operating condition.
- K. Each fixture shall be assembled from material components in a careful manner by persons experienced in their line of work. Forming, assembly and subassembly shall be accomplished such that all parts come together in the fixture to form a complete, well fitted integrated assembly.
- L. Conduit and wire entries to the fixture shall be field drilled by the contractor in the top or end plate of the chassis. Entry shall be flush with the top of the fixture.
- M. The entire lens area of the fixture (exclusive of door frame members) shall be illuminated. There shall be no black or unlit areas including those areas where ballast, power supplies, or sockets are located.
- N. Fixtures and luminaires must be manufactured in the United States and adhere to the ARRA Buy American Compliance Act.

## 2.02 POWER DISCONNECT FOR FIXTURES

- A. Provide a power disconnect in the conductors supplying the fixture ballast or LED engine.
- B. Disconnect shall be self-aligning (polarized) snap in type and shall contain three wires, one each for the hot, neutral and equipment ground conductor.
- C. Disconnect shall facilitate easy removal of the ballast or LED engine for maintenance and shall be prewired by the fixture manufacturer.
- D. Male side of disconnect shall be connected to the ballast or LED engine power lead-in wires so that exposed contacts are dead in the disconnected position.
- E. Disconnect shall be U.L. listed. The dielectric strength of the connector shall be 1500 volt minimum.

## 2.03 WIRING FOR FIXTURES

- A. Wire inside fixtures shall be copper conductor of ampacity required plus twenty-five percent (25%) for continuous load.
- B. Insulation shall be rated for 1000 volt AC and shall be rated for operation at 200 degrees C. in dry locations.
- C. Provide type FF glass braid insulation.
- D. All connections inside the fixtures shall be made with wire nuts rated for a minimum of 90 deg. C.

## 2.04 ON/OFF TOGGLE SWITCH FOR FIXTURES

- A. Provide a power toggle switch in the conductors supplying the fixture power supply.
- B. Toggle switch shall contain three wires, one each for the hot, neutral and equipment ground conductor.
- C. Toggle Switch shall facilitate easy removal of the power supply for maintenance and shall be prewired by the fixture manufacturer.
- D. Toggle switch shall be UL recognized and CSA approved. The dielectric strength of the connector shall be 1000 volt minimum.
- E. Toggle Switch to be installed next to power supply.

## 2.05 FUSE HOLDER AND FUSE FOR FIXTURES

- A. Fuse holder shall have compact through-panel design and facilitate easy replacement of fuse.
- B. Fuse Holder shall be rated for 30A, 600VAC.
- C. Fuse Holder shall be UL recognized and CSA approved. D.Fuse information 5 Amp replaceable fuse.

## 2.06 FLUORESCENT FIXTURES

- A. Fluorescent lamp fixtures four (4) feet in length shall be of the type as called for on the Light Fixture Schedule.
- B. All auxiliaries used with fixture shall have UL and CBM labels.
- C. Surface mounted fixtures shall have top reflector plates and shall be so designed so as to limit ballast case temperature to 90 degrees C.
- D. Fluorescent Lamp Ballasts:
  - 1. Provide electronic ballast for light fixtures rated to operate on 120 volt, 60 Hz circuits.
  - 2. Ballast shall be securely affixed to the interior of the fixture so that it is not affected by vibrations.
  - 3. The ballast shall carry the UL and ETL/CBM labels.
  - 4. The ballasts shall be provided with integral leads, color coded to ANSI Standard C 82.11, latest version.
  - 5. All ballasts for fluorescent fixture shall be specifically designed for cooler case and capacitor temperatures. Ballasts shall be premium grade class "P" as required by the National Electrical Code. Ballasts shall be fused when the Drawings show circuiting on 20 ampere single pole circuits.
  - 6. Fixture shall be designed to limit the ballast case temperature under all predictable operating conditions of the application intended to 90 degrees C.
  - 7. Ballast shall be mounted to a heat sink to facilitate removal of heat from fixture. Area of heat sink in contact with exterior metal of fixture shall be a minimum of twice the area of the ballast surface in contact with the heat sink.
  - 8. Ballast and wiring connections shall be inside the fixture housing and shall be easily accessible for maintenance and removable.
  - 9. Ballasts shall be automatic resetting type with individual capacitor protection.
  - 10. Electronic Ballast:



- a. Provide 800 MA high power factor electronic ballast for 6'-0" & 8'-0" long fixtures as indicated on the Drawings. (For indoor heated areas only). Provide electric ballast rated for -20 degrees F. for T8HO lamps (outdoor areas) and electronic ballasts for T8 lamp (indoor areas).
- b. The ballast shall be rated to start the lamps down to a temperature of -20 degrees F.
- c. The "High Frequency" electronic ballast shall operate lamps at a frequency of 20 KHz or higher without visible flicker. The electronic ballast's input current shall have Total Harmonic Distortion (THD) of less than 20% when used with primary lamp. The electronic ballast shall have a Power Factor greater than 98% when used with primary lamp. The electronic ballast shall have Lamp Current Crest Factor of less than 1.7, in accordance with lamp manufacturers' recommendations and ANSI C 82.11. The electronic ballast shall support a sustained short to ground or open circuit of any output leads without damage to the ballast. The electronic ballast shall have an audible noise rating of Class A or better. The electronic ballast shall meet ANSI C 82.11 standards regarding harmonic distortion. Ballast shall meet ANSI C 62.41 Cat. A for transient protection. The electronic ballast shall comply with all applicable state and federal efficiency standards. The electronic ballast shall be Advance, Motorola or MagneTek or approved equal. The electronic ballast shall carry a five (5) year warranty. Manufacturer shall be a full line ballast manufacturer with a ten (10) year history of producing electronic ballasts for the North American Market.
- d. Electronic ballasts shall maintain constant light output over operating ranges of 90 V. to 145 V.
- e. Electronic ballasts shall withstand line transients as defined in ANSI/IEEE C 62.41 Cat. A., and meet the requirements of the Federal Communications Commission Rules and Regulations, Part 18, for non-consumer equipment.

## 2.07 LED LIGHT SOURCE FIXTURES

### A. General:

1. LED Light Source Fixtures shall be of the type called for on the light fixture schedule.
2. LED Light Source Fixtures shall be four (4) feet in length.

### B. LED Light Source Fixture Sub-Assembly:

1. Each LED Light Source Fixture shall consist of one complete sub-assembly designed for field installation. Sub-assembly shall consist of the following:
    - a. LED board.
    - b. Aluminum heat sink/chassis.
    - c. Mounting plate.
    - d. Power supply.
    - e. Internal ON/OFF toggle switch.
    - f. Fuse.
  2. LED light source sub-assemblies will be built to UL8750 for LED Lighting Equipment and to UL1598C for Luminaire standards.
  3. The LED light fixture shall consume zero (0) watts in the off-state, excluding any control devices.
  4. Installation instructions for all LED light source sub-assemblies to be provided by the manufacturer.
- C. LED Light Source Sub-Assembly for 1' X 4" Fixture Type "B", Type "E" and "Type "H" :
1. Each fixture shall consist of three (3) LED boards.
  2. Total electric power consumption for each fixture to be rated at 54 watts.
  3. Each LED board shall consist of 54 LED chips with lumen outputs 38 per chip and color temperature 5000K.
  4. The LED board shall be securely affixed to mounting plate so that it is not affected by vibrations.
  5. The chip manufacturer shall be Samsung, Seoul Semiconductor, Cree, Philips, Nichia or other approved equal high quality industrial grade manufacturer.
- D. LED Light Source Sub-Assembly for 1' X 4" Angled Fixture Type "C":
1. Each fixture shall consist of two (2) LED boards.
  2. Total electric power consumption for each fixture to be rated at 54 watts.
  3. Each LED board shall consist of 54 LED chips with lumen outputs 38 per chip and color temperature 5000K.
  4. The LED board shall be securely affixed to mounting plate so that it is not affected by vibrations.
  5. The chip manufacturer shall be Samsung, Seoul Semiconductor, Cree, Philips, Nichia or other approved equal high quality industrial grade manufacturer.

E. LED Light Source, light engine and Light fixture Manufacturers:

1. Seesmart Lighting.
2. Cooper – (Geier) Lighting.
3. Kenall Lighting.
4. Hubbell Lighting.
5. Cree Lighting.
6. Kurtzon Lighting.
7. Acuity Brands (Lithonia Lighting).
8. Approved Equal.

F. LED Power Supply:

1. Power supply shall be Class 2 rated for a nominal input voltage of 120-277VAC with a voltage range of 108 – 305 VAC and a constant output voltage of 24VDC with an input frequency of 50/60 Hz, Nominal current of 2A, Current range of 1-2A, Current overshoot less than 20%, Ripple current less than 5%, and output voltage range of 18-24 VDC.
2. Power Supply shall be securely fixed to mounting plate so that it is not affected by vibrations.
3. Power supply shall carry UL and CE labels.
4. Power supply shall be rated for temperatures ranging from -40 to 90 degrees C. The power supply shall be suitable for use in dry and damp locations. The Total Harmonic Distortion (THD) shall be less than 20%. The power supply shall have a power factor greater than 95%. The power supply shall have an audible noise rating of Class A or better.
5. Power supply line transient harmonics shall comply with EN 61003-2 and EMC immunity shall comply with IED 640004-4. Surge protection shall comply with combination wave test procedures per IED 610004-5 and ANSI C62.41.
6. The electronic power supply shall be Philips Advance, MeanWell, Thomas Research Product, or approved equal. The power supply shall be long-life (100,000 hours) and carry a five (5) year warranty. Manufacturer shall be a full line power supply manufacturer with a ten (10) year history of producing power supplies for the North American Market.
7. The power supply shall conform to FCC rules and regulations, as per Title 47 CFR Part 15 Non-Consumer (Class A).

G. Lumen Depreciation:

1. Lumen depreciation per IESNA LM-80 is compared to the published lumen output of the product per IESNA LM-79 testing and reporting standards.
2. Normal accumulation of particules on the optical surfaces shall not be factored into the lumen depreciation.

3. A Coloring Rendering Index (CRI) of 85 shall apply to all LED lamps.

H. Light Engine Wattage:

1. Light engine wattage will vary by light fixture type.
2. Light engine modules to provide nominal 4000 initial bare lumens.
3. Life/lumen maintenance shall provide greater than or equal to 70% of the initial lumens at 50,000 hours.

2.08 RECESSED FIXTURES

- A. Recessed fixtures shall be of type suitable for mounting in the type of ceiling as scheduled on the Fixture Schedule. Variations to catalog numbers indicated on the Fixture Schedule shall be made by the Contractor prior to placing order for the fixtures to insure proper mounting arrangement.
- B. Fixtures installed in plenum ceilings shall be approved for that application.
- C. The Contractor shall furnish plaster frames for recessed fixtures in plastered rooms.

2.09 EXIT SIGN

- A. General Requirements: Comply with UL 924, be Chicago Code Approved/Wet Location, and the following:
  1. Provide as indicated on light fixture schedule included with contract drawings.
  2. Sign Colors and Lettering Size to comply with authorities having jurisdiction.
  3. Internally Lighted Sign: Light source for AC Operation to be White LED, 3.7 watts, 25 year life expectancy.
  4. Standard input voltage shall be 120 Volts AC
  5. Exit Sign shall be suitable for both interior and exterior locations.
  6. Housing shall 20-Gauge stainless steel, white powder coat finish with vandal resistant lens.
  7. Mounting shall be ceiling or back.
- B. Exit Signs to be self-powered, battery type, with integral automatic charger in a self-contained power pack.

1. Battery to be sealed, maintenance-free, nickel-cadmium type, 6-volt operation, with special warranty.
2. Charger to be fully automatic, solid-state type with sealed transfer relay.
4. Operation to be as follows: Relay automatically energizes LED light source from unit when circuit voltage drops to 80 percent of nominal or below. When normal voltage is restored, relay disconnects lamps, and battery is automatically recharged and floated on charger.

C. Manufacturer of Exit Sign fixtures:

1. Big Beam Emergency Systems.
2. Approved equal.

## 2.10 EXTERIOR LIGHTING

A. The Contractor shall furnish labor and install all material necessary to provide exterior lighting as indicated on the Drawings.

1. Fixtures shall be suitable for outdoor surface and suspended mountings.
2. Fixtures Type "H", shall be 4' fluorescent or LED type of similar construction, appearance and finish. Lens shall be clear prismatic polycarbonate with 0.187 inch thick and smooth outside.
3. Fixtures, Type "C", shall be triangular shaped suitable for outdoor corner mountings. The main beam shall be at 90 degrees to the lens surface.
4. Fixtures shall be of the enclosed and gasketed type suitable for wet locations. Ends and body shall be one piece or shall be made one piece by continuous (Heliarc) welding all seams, grinding them smooth and finishing to match the various parts.
5. Fixture type "B" and "E" shall be 4'-0" fluorescent or LED type of similar construction.

B. Chassis Construction:

1. Chassis shall be constructed of No. 304 stainless steel.
2. Fixture type "B" and "E" shall be 48"x12"x6-1/2" and shall be constructed from #18 gauge steel with minimum of two (2) interior reinforcing gussets.
3. Fixture Type "H" shall be 50.81" x 9.79" x 66.77" and shall be constructed from 16 gauge stainless steel with a minimum of two (2) interior reinforcing gussets.
4. Fixture type "C" shall be 48" x 7 3/4" x 7 3/4" and shall be constructed from 18 gauge steel with a minimum of two (2) interior reinforcing gussets.
5. All seams in the chassis shall be externally welded shut, ground smooth and finished to make a watertight enclosure. Welding shall be continuous of the Heliarc type.

6. Strength:

- a. Fixture chassis shall be designed with sufficient rigidity and strength to protect the components inside from damage and withstand without fracture or excessive permanent distortion due to weather or moderately determined acts of vandalism.
- b. Fixture shall withstand without damage 100 MPH winds and ice loads.
- c. Fixture shall withstand without excessive or permanent distortion a two hundred pound weight suspended from one end when it is supported from one point, 6" in from the fixture ends on its central axis for the 4' fixture.

8. Chassis shall be shaped to enhance structural rigidity and shall provide a seat on which the door frame and its gasket shall seal.

C. Finishes:

1. Stainless steel fixtures shall have a natural satin no. 4 finish.
2. Seam welds on all chassis shall be ground smooth and finished to match surrounding metal.

D. Diffuser (Door) Frame:

1. Frame shall rigidly and totally enclose and support the perimeter of the fixture diffuser and shall mate with the fixture chassis to form a weathertight seal.
2. Frame shall be constructed of minimum 12 gauge angle iron. Corner shall be mitered and seams fully welded and ground smooth. Frame material shall be the same as chassis.
3. Frame members and joints between members shall have sufficient rigidity as a unit to prevent distortion during relamping.
4. Frame shall be fully hinged along the long axis of the fixture with a continuous hinge. Door frame shall be attached to hinge at every six inches (6") with stainless screws.  
between the chassis and frame is compressed along its entire length.
6. Frame shall be constructed to permit removal of lens for replacement demounting the fixture or removal of the door. Removal shall be accomplished without breaking or distorting the frame.
7. Frame shall securely enclose the diffuser but shall provide adequate clearance for differential thermal expansion and contraction and shall permit diffuser to deform when it accepts impact.

E. Gaskets:

1. Gasketing shall be continuous on both sides and ends of the fixture between the hinged door and the upper housing (chassis) and between the diffuser and its supporting frame.
2. Gasketing material shall be close cell sponge neoprene, soft or medium density, evenly textured with high resistance to aging, heat, ultra-violet light, water, oils, weathering and setting.
3. Gaskets shall be cemented to the various components with resilient neoprene sealing compound. Compound shall be compatible with the finish to which it is applied.
4. Gasket shall not exhibit any noticeable stiffening at temperatures down to 0 deg. F. and shall be satisfactory for long life in summer and winter temperatures in Chicago.
5. Water and aqueous solutions shall not cause swelling nor be absorbed by the gaskets.
6. Gasket shall be self-extinguishing and flame resistant.

F. Mechanical Components:

1. Hinges for external fixture components.
  - a. Hinges shall be continuous and designed to prevent accidental disconnection of connected fixture components while being hinged down and in the open position.
  - b. Hinge shall be fabricated from the same material as the pieces connected thereby and shall be sufficiently rigid to prevent distortion in service.
  - c. Hinges where not an integral part of connected components shall be affixed to the pieces connected thereby with a continuous weld or other approved means to prevent distortion in service.
2. Hinges for internal fixture components:
  - a. Hinges for reflector and other internal fixture components shall be suitable for the weight suspended and the service requirements.
  - b. Hinges shall be firmly affixed to the pieces they connect and shall not bend or distort in service.
  - c. Hinges shall be fabricated from the same or galvanically compatible materials as the pieces connected thereby.
  - d. Hinges shall be designed to prevent accidental disconnection of fixture components connected thereby while being hinged down and in the open position but shall be capable of ready disconnection for removal or replacement of parts.

3. Locking Devices:

- a. All locking devices that must be activated for maintenance or relamping to vibration caused by the trains.
- b. All locking devices shall be of the captive design. Only stainless retainers shall be used to retain the screws in place.
- c. External locking devices shall be tamper resistant screws.
- d. Internal locking devices shall be quarter turn fasteners thumb operated type.

4. Fasteners:

- a. All threaded fasteners shall be made of the same material as the piece into which they are threaded. No aluminum fasteners will be permitted.
- b. All fasteners shall have a thread sealant applied to prevent vibration from loosening same.

G. Illumination Components:

1. Lamps:

a. Fluorescent

- i. Lamps shall be 48" nominal length as required to completely fill the length of the fixture.
- ii. Lamps shall be fluorescent type of the 800 MA high output preheat rapid start design.
- iii. Lamp color shall be cool white.
- iv. Lamp bases shall be recess double contact type.
- v. All lamps shall be spec. 41 as manufactured by Phillips Lighting Co. or approved equal.

b. LED

- i. LED lighting components shall be nominal length as required to completely fill the length of the fixture.
- ii. LED color 5000K
- iii. All LED light sources shall be manufactured by Samsung, Seoul Semiconductor, Cree, Philips, Nichia or approved equal.



2. Reflectors:

- a. Reflectors shall be formed from stainless steel and shall extend the full width and length of fixture.
- b. Reflector shall fasten into position with 1/4 turn fasteners and shall lock- up tight to prevent noise during vibration of fixture.
- c. Reflectors shall be finished with high reflectivity glass white enamel, baked on after the reflector has been degreased and phosphatized. Minimum reflectivity shall be eighty-seven percent (87%).
- d. Reflector mounting shall be such that the reflector can be easily removed for ballast changing by one man unaided.
- e. Reflector shall be prevented from falling out of the fixture when it is unlatched. Provide safety chains, hinges or other approved means of sufficient number and so located as to prevent reflector from swinging down and causing injury.
- f. Reflector shall be "V" shaped in the middle to give better lighting distribution and increase the efficiency of the fixture.

3. Diffuser:

- a. Diffuser shall be fabricated from .187 inch thick prismatic clear polycarbonate for "H" type fixture. Additional diffuser types for remaining fixtures.
- b. Diffuser shall effectively obscure the outline of the source during fixture operation and shall as far as practical maintain an even surface brightness across the diffuser.
- c. Lens/diffuser shall be fully enclosed and mechanically held in a completely gasketed, rigid door frame.
- d. The combination of lens/diffuser shall have all edges sealed to keep out dust, dirt and moisture.
- e. Provide prismatic and clear polycarbonate lens manufactured from General Electric "Lexan" or Rohm and Haas "Tuffac".
- f. The light transmittance rating of the lens shall be 0.86 inch minimum.

H. Electrical Components – Sockets (Fluorescent):

1. Sockets shall be basically porcelain of the telescopic tombstone design and shall be spring loaded for use with a recessed double contact HO fluorescent lamp.
2. Sockets shall have screw terminals for connection of ballast lead wires. Terminal screws shall be brass. No steel will be accepted.
3. Sockets shall be securely mounted to the fixture with four (4) screws and shall provide rigid support for the lamp.
4. Sockets shall be rated 600 volt AC and 660 watts.
5. Sockets shall be mounted so that telescopic spring tension, when lamped, will not produce distortion of the socket angle.
6. Socket plates shall be fabricated from 16 gauge stainless steel. It shall be rigid and removable from the fixture.

I. Light Poles (when required):

1. Provide 4 inch diameter tubular steel luminaire support poles as shown on the Drawings. Poles shall be of sufficient length to provide a nominal height of ten feet above the platform when resting on the platform support beams.
2. Poles shall be designed for a maximum wind loading of 100 MPH, with the specified fixture.
3. Provide plates, supports, and handholes as shown on the Drawings.
4. All welds shall be ground smooth and the poles shall be given a shop coat of primer, and made ready for field painting as indicated in specification 26 10 00. (Basic Electrical Materials and Methods)

2.11 LAMPS

A. Fluorescent

1. Fluorescent lamps shall be cool white to match the ballast unless otherwise indicated. Fluorescent lamps shall be F32/T8/TL741 for electrical room, janitor's room and kiosk and F48/T8/HO/TL841 for all other applications.
2. Acceptable manufacturers shall be General Electric, Sylvania, North American Phillips, or approved equal.

B. LED

1. LED color temperature 5000K.
2. Acceptable manufacturers shall be Seesmart, Cooper Lighting, Kenall Lighting or approved equal.

## 2.12 LIGHT CONTROL

- A. Provide local switching for all employee, maintenance, equipment and storage spaces. All other individual circuit switching shall be done at the panelboard.

## 2.13 ENVIRONMENTAL CONTROL

- A. Gaskets:
  1. Gasketing shall be applied continuous at specified interfaces.
  2. Gasket shall be applied around diffuser and its supporting frame and around diffuser door frame and fixture body.
  3. Gasketing material shall be closed cell neoprene, soft or medium density, even textured with high resistance to aging, heat, ultra-violet light, water, oils, weathering and setting.
  4. Gaskets shall be cemented to the various components with resilient neoprene sealing compound. Compound shall be compatible with the finish to which it is applied.
  5. Gasket shall not exhibit any noticeable stiffening at temperatures down to 0 degrees F and shall be satisfactory for long life in summer and winter temperatures in Chicago.
  6. Water and aqueous solutions shall not cause swelling nor be absorbed by the gaskets.
- B. Conduit entries shall be field drilled by the Contractor in the top or end plate of each fixture as required.

## 2.14 TEST FOR FIXTURES

- A. Fixtures shall be submitted in accordance with the requirements of the Special Conditions and Division 01. The Authority will determine if the submittal is in compliance with the requirements of this specification prior to the final acceptance of the fixture. Contractor shall submit one sample of each type of light fixture for approval of the Authority.
- B. Overall efficiency (fixture output in lumens/lamp lumens) shall not be less than 50% for "B" and "E" fixtures, and 45% for type "C" fixtures.
- C. A minimum of 85% of the fixture lumens output shall fall within 60 degrees from nadir for type "B" and "E" fixtures and 90% of the fixtures lumens output shall fall within 120 degrees from nadir for type "C" fixture.
- D. The main beam shall be at 90 degrees to the lens surface.

## 2.15 FACTORY INSPECTION

- A. Contractor shall require the manufacturer's production facility available to CTA for inspection before and after manufacture of the fixtures called for under this contract.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. The Contractor shall install the equipment in strict accordance with the approved shop drawings and the equipment manufacturer's recommendations.
- B. Where aluminum contacts concrete or dissimilar metal, separate contact surfaces with gasket, non-absorptive tape or bituminous coating to prevent corrosion. Use stainless steel fasteners. Aluminum fixtures shall not be installed in contact with wood, or in any other situation where permanent moisture can exist.
- C. Fixtures shall be mounted plumb, level and in straight lines. Group-mounted fluorescent/LED fixtures shall appear as one unit.
- D. In areas where industrial type fixtures are to be installed such as Equipment Rooms, fixtures which are near obstructions near the ceiling such as ducts, large pipes, groups of pipes, etc., shall be suspended so that the bottom of the fixture is not higher than the bottom of the duct, etc. Outlets shall not be located until the location of these obstructions are determined. Outlets shall not be covered; conduits shall be installed exposed. Fixture shall have standard wireguard.
- E. Lighting poles, when required, shall be installed as shown on the Drawings. The installation shall result in vertically plumb poles, and will provide for a minimum of fixture vibration.
- F. The Contractor shall supply all required lamps/LED lighting components, clean lamps, diffusers, globes, reflectors and exposed-to-view surfaces of fixtures after aiming and adjusting have been approved.
- G. The Contractor shall provide gasketing and other means to make the fixture mounting and conduit entry watertight.

### 3.02 FIXTURE SUPPORTS

- A. It shall be the Contractor's responsibility to provide and install all hardware to support all lighting fixtures adequately.
- B. Each lighting fixture shall be rigidly supported from the building construction and shall include suspension hangers devices and extra steel work for fixture support where required.
- C. The Contractor shall coordinate with the work of other trades to determine modifications required to make fixtures suitable for the location as installed, and verify the construction prior to fixture fabrication.
- D. Recessed fixtures shall be provided with the proper plaster frame or suitable adapter to receive the finished ceiling construction.
- E. Where suspended ceilings with steel channels occur, outlets and fixtures shall be supported on members resting on the channel framework. In no case shall fixtures be supported from plasterboard, plaster or acoustic material. No chains shall be used for hanging fixtures.
- F. The Contractor shall not use the lighting fixtures as raceways. Any connections to adjacent fixtures or continuous rows of fixtures shall be through the conduit system. Unistrut or other metal raceways are not acceptable for wiring connections.
- G. Suspended fixtures shall be hung on ball and cushion swivel flexible fixture hangers, as manufactured by Appleton Electric Company or approved equal, and furnished by the Contractor and shall be adjusted as necessary during installation to insure that all fixtures in the same room or area are a uniform height detailed or noted on the Drawings.

### 3.03 MOTION SENSOR SWITCH INSTALLATION

- A. Provide conduit, wiring and boxes for installation of motion sensor switches to control lighting in the space. Install according to manufacturer's directions. Provide for manual over-ride. Install on the line or side of switches.
- B. Program and adjust motion sensor switches for optimum operation at each space and Installation.

### 3.04 TESTING INSTALLATIONS

- A. The Contractor shall furnish necessary personnel and equipment and perform tests and adjustments in the presence of the Engineer. Schedule adjustment of exterior installations to occur during hours of darkness.
- B. The Contractor shall test lighting circuits for continuity and operation.
- C. The Contractor shall test fixtures and mounting poles for continuity of grounding system.
- D. The Contractor shall aim and adjust fixtures to provide distribution patterns approximately as shown and as approved.
- E. Once tested and accepted by the Engineer, Contractor shall provide a minimum of 20 percent spare lamps or LED light sources (rounded to nearest whole number) for each type of light source provided.

### 3.04 CIRCUITING

- A. The Contractor shall provide complete branch circuiting between panels and lighting fixtures. Circuits shall be as shown on the panel schedules.
- B. Final connection to light fixture shall be with heat resistant wire of the following type:
  - 1. Fluorescent 120 volt, Number 14 AWG Type THWN insulation.
  - 2. Incandescent 120 volt, Number 14 AWG Type SF-2 insulation.
  - 3. LED lighting 120 volt, Number 14 AWG Type THWN insulation.

END OF SECTION 26 50 10

SECTION 26 01 00  
GENERAL ELECTRIC PROVISIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and Division 01 Specification sections, apply to this section.

1.02 SUMMARY

- A. This Section specifies the basic electrical requirements for this project.
- B. The Contractor shall provide items, articles, materials, operations and methods required by the Drawings and Specifications including labor, equipment, supplies and incidentals necessary for completion of the Work under this Contract.
- C. Any incidental accessories necessary to make the work complete and ready for operation, even though not specified or shown on the Drawings shall be furnished and installed without additional expense to the Authority.
- D. Should there be any discrepancies or a question of intent, the Contractor shall refer the matter to the Engineer for decision before ordering any equipment, materials or before starting any related work.
- E. The Contractor shall furnish, erect, install, connect, clean, adjust, test and condition all manufactured articles, materials and equipment, and place in service in accordance with the equipment manufacturer's directions and specifications except as otherwise specified herein.
- F. Related work specified elsewhere:
- |     |                  |  |
|-----|------------------|--|
| 1.  | Section 26 03 00 | Electrical Demolition.                 |
| 2.  | Section 26 05 00 | Raceways and Boxes.                    |
| 3.  | Section 26 10 00 | Basic Electrical Materials and Methods |
| 4.  | Section 26 12 30 | Wires, Cables, Splices, Terminations.  |
| 5.  | Section 26 14 10 | Wiring Devices.                        |
| 6.  | Section 26 17 00 | Local Control                          |
| 7.  | Section 26 17 50 | Local Control Panels                   |
| 8.  | Section 26 19 00 | Grounding                              |
| 9.  | Section 26 19 50 | Identification                         |
| 10. | Section 26 47 00 | Panelboards                            |
| 11. | Section 26 50 10 | Lighting Fixtures                      |
| 12. | Section 26 95 00 | Electrical Testing                     |

#### 1.04 QUALITY ASSURANCE

- A. Materials and installation shall conform to the applicable Codes and Standards.
- B. After all equipment, devices and raceways are installed and wires and cables are in place and connected to devices and equipment, the Contractor shall test the system for continuity, proper phase rotation, short circuit, improper grounds, and other defects. If any defective conditions are present, the Contractor shall make all necessary corrections and retest for compliance.
- C. Each major component of equipment shall have the manufacturer's name, address, model number and rating on the manufacturer's nameplate securely affixed in a conspicuous place.
  - 1. The nameplate of a distributing agent is not acceptable.
  - 2. Code ratings, labels or other data, including any that are die-stamped into the surface of the equipment, shall be in a visible location.

#### 1.05 CODES AND STANDARDS

- A. Materials and installation shall comply with codes, laws and ordinances of Federal, State, and Local governing bodies having jurisdiction.
- B. In every installation where regulations of electric utility and telephone companies apply, conformance with their regulations shall be mandatory and any costs incurred shall be included in the Contract.
- C. In case of differences between building codes, State and Federal laws, local ordinances and utility companies regulations and the Contract Documents, the most stringent shall govern.
- D. All equipment and materials purchased for this Project shall conform to any acts, laws, rules and regulations of the following organizations:
  - 1. City of Chicago Electrical Code shall take jurisdictional precedence over all other authoritative bodies.
  - 2. National Electrical Safety Code (NESC-ANSI C2).
  - 3. American National Standards Institute (ANSI).
  - 4. National Fire Protection Association (NFPA).
  - 5. Institute of Electrical and Electronics Engineers (IEEE).
  - 6. Insulated Cable Engineers Association (ICEA).
  - 7. National Electrical Manufacturers Association (NEMA).
  - 8. Illuminating Engineering Society (IES).
  - 9. Underwriters Laboratories Inc. (UL).
  - 10. Canadian Standards Association (CSA).
  - 11. Occupational Safety and Health Administration (OSHA).



- E. Should Work be performed which does not comply with the requirements of the applicable building codes, State and Federal laws, local ordinances, industry standards and utility company regulations, changes for compliance shall be done at no additional cost to the Authority.
- F. The Contractor shall secure and pay for all required permits, governmental fees, taxes and licenses necessary for the proper execution and completion of the Electrical Work.
- G. The Contractor shall submit to governmental agencies and utility companies any shop drawings for equipment, which require their approval.
- H. The Contractor shall notify the Engineer of any proposed materials or apparatus believed to be inadequate, unsuitable, in violation of laws, ordinances, rules or regulations of authorities having jurisdiction.

#### 1.06 INFORMATION REQUIREMENTS

- A. Pre-Installation Submittals of the following types are required for the listed categories.
  - 1. Shop Drawings are required for the following.
    - a. Equipment details for switchgear, panelboards, transformers, etc.
    - b. Special systems for fire alarm, public address, security, etc.
    - c. Lighting fixtures for custom and non- standard design.
  - 2. Catalog Cuts shall cover common materials and supplies such as conduit, wire, devices, manufacturers standard lighting fixtures, etc.
  - 3. Installation drawings shall cover equipment, materials supplies where installation is not adequately detailed on the Contract Documents. The electric room conduit and equipment layout shall be provided.
  - 4. The equipment manufacturers wiring diagrams shall show terminal blocks for external wiring.
  - 5. The equipment manufacturers internal point to point and external wiring diagrams between cubicles, panels and components within the equipment line up shall be provided.
  - 6. Complete rating data for all equipment shall be provided.
  - 7. Instruction books, operation and maintenance manuals with spare parts manuals shall be provided.

B. Post construction submittals are required for the following types of documents.

1. Shop drawing installation drawings shall be updated to "Record Document" status.
2. Record Documents shall indicate the actual "as installed" status of all equipment, controls and materials incorporated into the facility.
3. Test data shall be provided for all equipment and wiring as required by various sections of these Specifications.
4. Instruction books, operations and maintenance manuals, spare parts lists shall be provided for all equipment and special systems.

C. Installation Drawings:

1. In addition to the preparation and submittal of Shop Drawings for manufactured electrical equipment and materials, the Contractor shall prepare and maintain in current status, a complete set of detailed, completely circuited, and dimensioned electrical construction drawings for all electrical work included under this Contract. These drawings shall be made at the Contractor's expense and shall be made on mylars.
2. The installation drawings shall be made under the direction and supervision of the Contractor and shall show all electrical work inclusive of conduit, wiring, electrical equipment and devices, lighting fixture locations and elevations, points where conduit enters or leaves structural slabs and walls, junction boxes, conduit supports and inserts. Symbol representation for home run circuits will not be acceptable.
3. The Contractor shall provide a separate set of installation drawings for the lighting system; a separate set of installation drawings for the power and control; and a separate set of installation drawings for the special systems.
4. The complete electrical distribution system from source or sources up to and including each branch circuit panelboard shall be shown and dimensioned exactly as installed, with all feeders located on the Drawings. Major equipment, lighting controls and apparatus shall be shown to scale and properly located; conduit home runs are not acceptable.
5. The installation drawings shall include floor plans and reflected ceiling plans with electrical layouts drawn at a scale (or scales) as required with a minimum scale of 1/8 inch equal 1 foot, 0 inches. It is intended that installation drawings of each trade be the same scale(s) in order to permit respective plans to be superimposed upon all others of each trade.

6. In addition to the floor plans, the layouts of all congested areas such as mechanical and/or electrical equipment rooms, and all functionally critical areas shall be drawn at a minimum scale of 1/4 inch equals 1 foot, 0 inches, and with all details of construction shown. The Engineers may request additional installation drawings if in their opinion they are required to properly coordinate the project.
7. The installation drawings shall include schedules for all panelboards. Schedules shall depict the bus arrangement of the panelboard, the size of all circuit breakers, the connected load on each breaker, and a description of the load and its location.
8. All installation drawings shall be made on 3 mil mylar sheets of the same size and with the same border lines and title blocks as the Contract Drawings, with the Contractor's name added.
9. The Contractor shall be responsible for the coordination of electrical work with the work of all other trades and shall, in preparing the installation drawings, continually check the work of all other trades (inclusive of that indicated by shop drawings) in order to avoid possible installation conflicts arising. It shall be understood that the work shown on the installation drawings has been so coordinated. In the event of conflicts or interferences that cannot be resolved in the field, the Contractor shall request a written clarification from the Engineer.
10. The installation drawings shall indicate the electrical installation exactly as constructed and therefore shall be periodically revised to reflect all changes inclusive of those required by the Engineer, those which are or have been found necessary in the field, those which may be suggested by the Contractor and approved by the Authority, etc.
11. Conduits shall be shown on the installation drawings as installed. Conduit home runs are not acceptable.
12. Revisions shall be performed when considered necessary by the Authority or the Contractor in order to facilitate proper coordination, but shall in no event be performed at interim periods exceeding 30 days between each such revision.
13. The initial copy of all installation drawings shall be submitted to the Engineer for review. These submittals shall be considered as shop drawings and are subject to the shop drawing approval process. Subsequent revised copies shall be issued to the Engineer as requested. It shall be clearly understood that these installation drawings are for installation coordination purposes only and cannot in any way alter the requirements of the Contract. Therefore, the Drawings, Specifications, and authorized revisions thereto, shall remain the only determinants of the Contract requirements.

14. Upon completion, the initial installation drawings, and all revised installation drawings thereafter, shall be dated and certified by the Contractor as having been fully coordinated. It shall then be understood that the work shown thereupon is ready for construction.
15. No electrical work shall begin until these installation drawings (and each revision thereof) are so drawn, and thereafter finally accepted by the Authority.
16. All installation drawings shall be made in accordance with an approved schedule, prepared by the Contractor, and arranged to coincide with actual construction in such a manner as to allow the latter work to proceed without delay.
17. If, in the opinion of the Engineer, the installation drawings are in acceptable condition after each has been finally revised and accepted, the Contractor may submit same as the field record drawings called for elsewhere in the Specifications.
18. The Contractor shall include wiring diagrams and schematic diagrams. Each schematic diagram shall be "JIC" ladder type. Wire numbers shall be shown on all schematic and wiring drawings.
19. The minimum drafting letter size shall be 1/8 inch in height, block style.

C. The Contractor shall submit test reports as described under this Contract.

#### 1.07 DRAWINGS

- A. The Drawings are diagrammatic and are intended to convey the scope of work and indicate the general arrangement and/or sizes of conduit, equipment, fixtures and other work included in the Contract.
- B. The location of items required by the Drawings or Specifications where not definitely fixed by dimensions on the Drawings are approximate only. The exact locations necessary to secure the best conditions and results shall be determined at the site and shall be subject to the approval of the Authority.
- C. The Contractor shall coordinate the location of the lighting fixtures and intercommunication speakers with the location of the mechanical equipment.
- D. The Contractor shall lay out the work, check drawings of other trades to verify spaces in which work shall be installed, and maintain maximum headroom and space conditions at all points.

1. Where headroom or space conditions appear inadequate, the Contractor shall notify the Authority before proceeding with installation.
2. Any minor changes in the locations of equipment, fixtures, lighting fixtures conduits, outlets, devices, etc., from those locations as shown on the Drawings shall be made without extra charge to the Authority. A minor change in location shall be considered to be within 10'-0" of the location as may be scaled from the Drawings for all interior work and within 25'-0" for all exterior work.

#### 1.08 SUBMITTALS

- A. The Contractor shall submit samples, shop drawings and installation drawings in accordance with Division 01 Section, Submittals, and supplementary requirements as stated under the sections of these Specifications.
- B. As soon as practical and within thirty days after award of contract and before any material or equipment is purchased, the Contractor shall submit to the Engineer for approval one set and six prints of all shop drawings to be incorporated in the work.
- C. Shop drawings shall include manufacturers' names, catalog numbers, cuts, diagrams and other such descriptive data as may be required to identify and approve the equipment.
- D. Extended time for submitting special shop drawing may be requested; however, an extension of time approved does not relieve this Contractor of the responsibility of executing the work in accordance with the Contract.
- E. Any listed materials, fixtures, apparatus, or equipment that are not in accordance with the Specification requirements can and will be rejected for use in this installation and construction.
- F. Any materials, fixtures, apparatus or equipment installed without stamped or written approval shall be removed by the Contractor and replaced with specified equipment at the direction of the Engineer and without recourse for additional compensation.
- G. Substitutions to listed acceptable manufacturers equipment and material will not be accepted until the Contractor has complied with the Specification Division One.

1.09 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Equipment and materials shall be delivered to the site and stored in original containers, suitably sheltered from the elements and mechanical injury, but readily accessible for inspection until installed.
  - 1. Items subject to moisture damage shall be stored in dry heated spaces.
  - 2. Manufacturer's directions shall be followed in the delivery, handling, storage, protection, installation and operation of all equipment and materials.
- B. The Contractor shall determine, from examination of the Drawings, whether any special temporary openings in the building will be required for the admission of apparatus furnished under this section, and notify the Engineer accordingly. In the event of failure to give sufficient notice in time to arrange for these openings during construction, the Contractor shall assume all costs of providing such openings thereafter.
- C. The Contractor shall coordinate with the Authority the movement of heavy machinery, equipment and heavy parts thereof brought into or onto the building or premises.
- D. Conduit openings shall be kept closed by means of plugs or caps to prevent the entrance of foreign matter.
- E. The Contractor shall cover all fixtures, equipment and apparatus as required to protect them against dirt, water, chemical, solar, or mechanical damage. The Contractor shall also provide any supplementary heating and cooling required to prevent moisture and thermal damage.
- F. Equipment shall be inherently safe and moving parts shall be covered with guards.
- G. Equipment in storage having moving parts, which may be damaged or distorted by being idle, shall be rotated or exercised periodically and all lubricants shall be properly maintained.

1.10 EXECUTION, CORRELATION AND INTENT OF DOCUMENTS

- A. In the event that conflicts, if any, cannot be settled rapidly and amicably between the affected trades, with the Work proceeding in a workmanlike manner, then the Engineer shall decide which Work is to be relocated. The Engineers judgment shall be final and binding on the Contractor.
- B. No measurements of a Drawing by scale shall be used as a definite dimension to work by.

1.11 INSTRUCTIONS AND ADJUSTMENTS

- A. At the conclusion of the Work and before final contract payment is made, the Contractor shall demonstrate and explain to the Authority the function, operation and maintenance of all equipment and systems installed.
- B. The primary adjustments of the system(s) shall be accomplished by the Contractor to the complete satisfaction of the Authority at the time of completion of the installation.

1.12 GUARANTEE

- A. The Contractor shall be responsible for all Work in this Specification. The Contractor shall make good, repair, or replace at his own costs and expense as may be necessary, any defect which in the opinion of the Engineer is due to imperfections in material, design or workmanship or if defect shows itself to be defective within one year after acceptance by the Engineer.
- B. The Contractor shall be responsible for protecting all equipment and systems against harmful exposures to, or accumulations of dust and moisture, flooding, corrosion or other forms of damage and shall clean and restore damaged finishes as may be required to place installations in a "Like New" condition before acceptance by the Authority.
- C. All manufacturers' equipment guarantees or warranties shall be included in the Maintenance Manuals.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment shall be new and shall be UL or CSA labeled where applicable and shall bear the manufacturer's name, model number and other identification markings.
- B. Materials and equipment shall be the standard product of a manufacturer regularly engaged in the production of the required type of material or equipment for at least five years (unless specifically exempted by the Engineer and shall be the manufacturer's latest design with published properties, that meet the specification requirements.
- C. Equipment and materials of the same general type shall be of the same manufacturer throughout the project to provide uniform appearance, operation and maintenance.
- D. Equipment and materials shall be without blemish or defect and shall not be used for temporary light or power purposes, including lamps, without the Engineer's written authorization.

2.02 ENCLOSURES FOR ELECTRICAL EQUIPMENT/FITTINGS

- A. Enclosures for Electrical Equipment shall be governed by the area classification described below or unless otherwise noted on the Drawing.
- B. NEMA Type 1A may be used in dry indoor environmental with full time filtered air supplies.
- C. NEMA Type 12 shall be used in indoor dry and non-chemical environment.
- D. NEMA Type 13 oil tight devices shall be used for all control panels.
- E. NEMA Type 4X stainless steel shall be used in exterior, interior wet areas, and corrosive environment where chemicals are stored or mixed with liquids.
- F. NEMA Type 7/9 hazardous, shall be used in all hazardous areas.



## 2.03 MOTOR VOLTAGE OPERATION

- A. Unless otherwise noted, all AC motors shall be operated on the following voltages:
  - 1. Motors under 1/2 horsepower shall be 115 volts AC, single phase, 60 hertz.
  - 2. Motors 1/2 horsepower and larger shall be 208 volts AC, 3 phase, 60 hertz.
- B. AC motor type, enclosure type, and other design requirements shall be as specified in these Specifications.

## PART 3 EXECUTION

### 3.01 INSTALLATION OF WORK

- A. The Contractor shall perform all Work with trained mechanics of the particular trade involved in a neat and workmanlike manner as approved by the Authority.
- B. The Contractor shall perform all Work in cooperation with other trades and schedule to allow speedy and efficient completion of the Project.
- C. The Contractor shall furnish other trades with advance information on locations and sizes of frames, boxes, sleeves and openings needed for the work, and also furnish information and shop drawings necessary to permit trades affected to install their work properly and without delay.
- D. Where there is evidence that the work of one trade will interfere with the work of other trades, all trades shall assist in working out space conditions to make satisfactory adjustments and shall be prepared to submit and revise coordinated shop drawings and installation drawings.
- E. With the approval of the Authority and without additional cost to the Authority, the Contractor shall make minor modifications in the Work as required by structural interferences, by interferences with work of other trades or for proper execution of the Work.
- F. Minor changes in the locations of outlets, fixtures and equipment shall be made at the direction of the Authority prior to rough-in and shall be at no additional cost to the Authority.

- G. The equipment shall be installed with ample space allowed for removal, repair or changes to equipment. Ready accessibility to removable parts of equipment and to wiring shall be provided without moving other equipment which is to be installed or which is in place.
- H. Locations of electrical outlets, lighting panels, cabinets, equipment, etc. are approximate and exact locations shall be determined by the Contractor at the Project site.
- I. The Contractor shall refer to the Contract Documents for details and reflected ceiling drawings.
- J. The Contractor shall protect the materials and work of other trades from damage during installation of the work provided under this Contract.

### 3.02 EQUIPMENT NOISE LIMITATION

- A. Noise levels of electrical devices and equipment shall be within acceptable limits as established by NEMA or other valid noise rating agencies. Noise levels shall be subject to the Authority's acceptance which will be based on practical and reasonable considerations of occupancy requirements.
- B. The Contractor shall check and tighten the fastenings of sheet metal plates, covers, doors, and trims to prevent vibration and chatter under normal conditions of use.
- C. When located elsewhere than in high-noise-level equipment rooms, the enclosures or solenoid-operated switching devices and other noise-producing devices shall have anti-vibration mountings and non-combustible sound-absorbing linings.
- D. Transformers, reactors, dimmers, lamp ballasts, and solenoids shall be designed and rated for "quiet" design.
- E. The Contractor shall remove and replace any individual electrical item or device that is found to produce a sound energy output exceeding that of other identical devices installed at the Project.

3.03 TRANSMISSION OF VIBRATION

- A. Electrical equipment, conduit, and fittings shall not be mounted to or supported by elements subject to vibration except by methods specified here in and/or shown on the Drawings.
- B. Where flexible conduit lengths are utilized as a means of isolating equipment and conduit systems vibration, care shall be exercised to assure continuity of ground throughout. Flexible conduit lengths shall be a maximum of 18 inches in areas where same are permitted.

3.04 PROTECTION

- A. The Contractor shall protect conduit and wireway openings against the entrance of foreign matter by means of plugs or caps.
- B. The Contractor shall cover fixtures, materials, equipment and devices furnished or installed under this Contract or otherwise protect against damage, before, during, and after installation.
- C. Fixtures, materials, equipment, or devices damaged prior to final acceptance of the Work shall be restored to their original condition or replaced.
- D. Equipment shall be inherently safe and moving parts shall be covered with guards.

3.05 INSTALLATION OF WORK FOR OTHER SECTIONS

- A. The Contractor shall coordinate all electrical work and shall complete all wiring, conduit, material and electrical equipment as required for equipment installed under other divisions of these Specifications.

END OF SECTION 26 01 00

SECTION 26 05 00  
RACEWAYS AND BOXES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and Division 01 Specification sections apply to this section.

1.02 SUMMARY

A. This section specifies all raceways and boxes as well as appurtenances thereto required under Division 26.

B. Related work specified elsewhere:

- |     |                  |  |
|-----|------------------|--|
| 1.  | Section 26 01 00 | General Provisions                     |
| 2.  | Section 26 03 00 | Electrical Demolition.                 |
| 3.  | Section 26 10 00 | Basic Electrical Materials and Methods |
| 4.  | Section 26 12 30 | Wires, Cables, Splices, Terminations.  |
| 5.  | Section 26 14 10 | Wiring Devices.                        |
| 6.  | Section 26 17 00 | Local Control                          |
| 7.  | Section 26 17 50 | Local Control Panels                   |
| 8.  | Section 26 19 00 | Grounding                              |
| 9.  | Section 26 19 50 | Identification                         |
| 10. | Section 26 47 00 | Panelboards                            |
| 11. | Section 26 50 10 | Lighting Fixtures                      |
| 12. | Section 26 95 00 | Electrical Testing                     |

PART 2 PRODUCTS

2.01 RACEWAYS AND BOXES

A. General:

1. All wire and cable shall be installed in electrical raceways of the type specified herein and shown on the Drawings.
2. Minimum size conduit shall be 3/4 inch for RGS, 1-1/2 inch for fiberglass.

B. Galvanized Rigid Steel Conduit:

1. Galvanized rigid steel (GRS) conduit and fittings shall be installed in all above ground areas of this Project except as noted herein.
2. GRS conduit shall be heavy wall type, hot-dipped galvanized with zinc-coated threads, and Underwriters' Laboratory labeled.
3. GRS conduit and couplings shall be threaded, rigid steel, hot-dipped galvanized after fabrication and shall be in accordance with UL 6.

C. Intermediate metal conduit (IMC) is not acceptable.

D. Rigid Non-Metallic Conduit:

1. Non-metallic rigid conduit shall be used for underground feeders, service feeders, and under concrete slabs on grade.
2. Non-metallic rigid conduit shall be of the fiber glass reinforced epoxy type, minimum size of 1-1/2 inches in diameter.
3. Fibre glass conduit shall be composed of glass filament encapsulated in an epoxy matrix. Each conduit length shall have an integral wound in expanded coupling. No threads or adhesives shall be required to assure watertight joints for underground installations.
4. Conduit shall be suitable for continuous operation from minus 40 degrees C to plus 100 degrees C without significant change of mechanical properties. Conduit shall be pigmented with carbon black dispersed homogeneously throughout the epoxy glass matrix for UV protection.
5. Conduit shall be UL listed.

E. Liquid-Tight Flexible Metal Conduit:

1. Liquid tight flexible metallic conduit shall be used for termination at recessed light fixtures, in non-plenum ceilings, motors, transformers, and installations subject to vibration.
2. Liquid-tight galvanized steel flexible conduit shall conform to UL 360. Fittings shall be of a type designed to provide a liquid-tight continuation of the conduit system.

F. Liquid Tight Flexible Metal Tubing:

1. Liquid tight flexible metal tubing shall be used for termination at recessed light fixtures, in plenum ceilings.
2. Liquid tight metal flexible metal tubing shall conform to UL 360, Fittings shall be of a type designed to provide liquid-tight continuation of the conduit system.

G. Conduit Fittings:

1. Galvanized Rigid Steel Conduit:

- a. All fittings shall be; malleable iron; threaded type; hot dip galvanized or cadmium plated. Ferrous, aluminum, or threadless fittings are not acceptable and shall not be provided.
- b. All LB, LR, and LL fittings shall have detachable cover, captive brass machine screws, and full neoprene gasket. All LB, LR and fittings shall be NEC Series Mogul Type.
- c. Locknuts shall be malleable iron or steel, with non-slip notches.
- d. All bushings shall be of the insulated and grounding type.
- e. Expansion couplings shall have capability of four inch movement and be complete with flexible bonding jumper.

2. Rigid Non-Metallic Fiberglass Reinforced Epoxy Conduit:

- a. All fittings shall be composed of glass filaments encapsulated in an epoxy matrix.
- b. All fittings shall be pigmented with carbon black dispersed homogeneously throughout the epoxy glass matrix for ultra-violet protection.
- c. All fittings shall be suitable for continuous usage in ambient temperatures ranging from minus 40 degrees C to plus 100 degrees C without significant change of mechanical properties.
- d. Fittings in all sizes shall have inside diameters equal to the trade sizes.

3. Liquid-tight Flexible Metallic Conduit:

- a. All fittings for use with liquid-tight flexible metallic conduit shall require the use of a wrench during installation.
- b. All fittings shall; have a deep grip ferrule for thorough engagement of the flexible conduit and grounding continuity; provide high resistance to pull out of the flexible conduit from the fitting; withstand extreme external flexing, vibration and moist environments.

H. Conduit Hangers and Supports:

1. The Contractor shall provide all necessary conduit hangers, and equipment supports or hangers, including all structural steel members and shapes, standard rods, nuts, bolts, concrete inserts, expansion shells, pipe brackets, tubing and conduit clamps, as indicated, hereinafter specified, or as required to support and/or suspend all equipment and conduit.
2. Exposed conduit on walls or ceilings shall be supported, a minimum of every five feet, with galvanized malleable iron one hole clamps and matching backs, utilizing anchors as specified herein.
3. For concrete or brick construction, when stray current isolation is not required, insert anchors shall be zinc alloy steel or steel anchors as manufactured by Ackerman-Johnson, Paine or Philips with noncorroding round head machine screws.
4. For wood construction provide galvanized round head wood screws.
5. For exposed work, where two or more conduits, one inch or larger are run parallel, trapeze hangers, spaced on five foot centers may be used.
6. The Contractor shall secure fasten conduits to each support with U bolts, or conduit straps. Conduit supports shall be as manufactured by B-Line, OZ/Gedney, Unistrut Corp., or approved equal. Supports shall be held to concrete walls and ceilings by electro galvanized steel inserts as manufactured by B-Line, Ramset, Unistrut Corp., or approved equal. Supports suspended from steel structure shall be supported from drilled holes in the steel flange. The use of beam clamps for this work is not acceptable.
7. The Contractor shall provide hanger rods for trapeze type hangers made from high tensile strength carbon steel not less than 1/2 inch diameter. The rods shall have free running, burr free Unified National Coarse threads, with an electro galvanized finish. Conduit supports shall be located at intervals not exceeding 5 feet as required by City of Chicago Electrical Code.
8. For exposed work attached to the support structure of the Rapid Transit right of way, conduits shall be supported as shown on the Drawings. The use of beam clamps, and or trapeze type hangers for this work is not acceptable.
9. The use of explosive force, hammer actuated, booster assist, piston drive, or like devices is strictly prohibited.
10. The use of perforated strap hangers, plastic, or composition inserts is not acceptable.
11. The Contractor shall support vertical conduits by heavy wrought iron clamps or collars anchored in construction at each floor.
12. Where threaded fasteners are provided, either a jam nut or aerobic thread sealant manufactured by Loctite or approved equal shall be used.

I. Outlet, Junction and Pull Boxes:

1. Outlet boxes, shall be hot dipped galvanized sheet steel or cast ferrous metal conforming to UL 514, suitable for use in damp areas.
2. Outlet boxes installed outdoors, on, or under the platform, shall be cast iron type with a cast or malleable iron gasketed cover.
3. Junction and pull boxes shall be constructed of galvanized sheet steel, with continuously welded seams, and shall be hot dipped galvanized after construction. or cast Ferrous metal conforming to UL 50.
4. The size shall be as shown on the Drawings or required by the NEC and Chicago Electrical Code.

J. Cable Trays:

1. Cable trays shall be of the ventilated, steel ladder type with 9 inch rung spacings. Trays shall have the depth and width as specified, required or shown on the Contract Drawings. All components of the tray system shall be of the same design and manufacture.
2. Cable trays and accessories shall conform to NEMA Standard VE 1 and shall be hot dipped galvanized after fabrication.
3. Cable trays shall have minimum load rating of 50 pounds per linear foot with safety factor of 1.5 at 12-foot support span.
4. Fittings in cable trays system shall have a minimum radius of 24 inches for both vertical and horizontal turns.
5. Trays and fittings shall be of Ventray Design as manufactured by B-Line Systems, Chalfant Mfg Co., MP Husky Corp. or approved equal.

PART 3 EXECUTION

3.01 CONDUIT INSTALLATIONS

A. General:

1. All conduits shall be installed as required. The conduit system shall be installed complete with all accessories, fittings, and boxes, in an approved and workmanlike manner to provide proper raceways for electrical conductors.
2. All conduit runs shown on the Drawings are shown diagrammatically for the purpose of outlining the general method of routing the conduits. Conduit shall be run underground or in concrete slabs only when shown on the Drawings. It shall be the Contractor's responsibility to avoid interferences.



3. Exposed conduit runs shall be installed true, plumb, parallel with or at right angles to adjacent structural members, and must present an orderly, neat and workmanlike appearance.
4. Factory made conduit bends or elbows shall be used wherever possible in making necessary changes in direction. Field bends shall be made with proper tools for the size and type of conduit being used. Field bends shall be carefully made to prevent conduit damage or reduction in internal areas. The bending radius shall not be less than six times the nominal diameters of the conduit, with carefully matched bends on parallel runs to present a neat appearance. The number of crossovers shall be kept to a minimum.
5. All conduit cut on the job shall be carefully reamed after threading, to remove burrs. All field cut threads shall be tapered. No running threads will be permitted. Field cut threads on steel conduit shall be given a coat of zinc dust in oil, or other approved compound.
6. All threaded joints shall be watertight and ensure a low resistance ground path in the conduit system.
7. All conduits shall be carefully cleaned before and after installation and all inside surfaces shall be free of imperfections likely to injure the cable. After installation of complete runs, all conduits shall be snaked with an approved tube cleaner equipped with an approved cylindrical mandrel of a diameter not less than 85 percent of the nominal diameter of the conduit. Any conduits through which the mandrel will not pass shall be removed and replaced. After snaking, the ends of the dead ended conduits shall be protected with standard malleable metal caps to prevent the entrance of water or other foreign matter.
8. Lines of nylon or polypropylene, propelled by carbon dioxide or compressed air, shall be used to snake or pull wire and cable into conduits. Flat steel tapes or steel cables may be used for branch circuit runs less than 50 feet long.
9. Where conduits are connected to boxes or equipment enclosures, drilled holes or full size knockout openings shall provide electrical continuity for grounding and shall be assured by the use of bonding type locknuts. Where connections are at eccentric or concentric knockouts, jumper type grounding bushings and wire jumpers shall be installed.
10. At pull and junction boxes that have any dimension in excess of 18 inches and having a total of more than four conduit terminations, jumper type grounding bushings shall be installed on conduit ends and jumper wires shall be installed to bond all conduits and to bond conduits to boxes.
11. Communication conduit radius shall not be less than 10 conduit diameters.
12. Conduit bends which are crushed or deformed in any way shall not be installed.

13. Conduit systems shall be installed, with fittings, double locknuts and bushings, and made up tight to insure ground continuity throughout the system.
  14. Conduit connections to NEMA Type 3R enclosures shall terminate in a threaded hub with an insulated throat to provide a positive seal, an electrical ground and a water tight connection. Each hub shall be manufactured by Meyers, 0Z/Gedney Type CH-T, or approved equal.
- B. As far as practicable, conduit shall be pitched slightly to drain to the outlet boxes, or otherwise installed to avoid trapping of condensate. Where necessary to secure drainage, a breather drain fitting, shall be installed in the boxes or trapped conduit at low points. Each breather drain fitting shall be manufactured by Crouse Hinds Co., Appleton Electric Co., or approved equal.
- C. Conduit shall not run through columns or beams unless so specifically detailed on the drawings.
- D. Conduit Installed in Concrete Slab
1. Metal conduits shall not be installed in concrete slabs on grade. Where installed in slabs, conduit shall be placed in the center of the slab and no closer than 3 diameters from adjacent conduits. The maximum outside diameter of conduits in the slab shall be no greater than 1/3 of the slab thickness.
  2. Joints in conduit installed in concrete slabs shall be made watertight.
  3. Conduit openings shall be temporarily plugged with metal caps to exclude water, concrete, plaster and other foreign material.
  4. Conduits run in earth below any floor slab shall be rigid non-metallic conduit and shall be entirely encased in reinforced steel concrete. In no case shall conduit be laid in fill below the slab.
  5. Conduits embedded in concrete shall be blocked and braced in place by use of adequate conduit separators to prevent displacement during the placing of concrete.
  6. The Contractor shall be held responsible for proper position of conduits and shall rearrange any conduit that may be displaced while concrete is placed.
  7. Conduits run in floor slabs shall be a minimum one inch in size, and as shown on the Drawings.
- E. The number of 90 degree bends shall be limited to 3 or a total of 270 degrees including all offsets, sweeps, kicks, etc. This shall include conduit runs between panelboards, switchboards, pullboxes, outlets boxes, fittings, or between outlets and fittings including bends located immediately adjacent to outlets or fittings. The maximum run without pull boxes shall be 150 feet.

- F. The Contractor shall furnish and install expansion fittings and bonding jumpers for the metallic conduit system where conduit crosses each building expansion joint, at each straight uninterrupted run of surface mounted conduit, or each vertical riser in excess of 100 feet and where conduits transfer between structurally independent buildings or supports. The distance between fittings as installed shall not exceed 200 linear feet.
1. Expansion fittings shall provide for 8 inch movement and shall include bonding jumpers.
  2. Expansion fittings shall be Appleton XJ with XJB jumpers, Crouse Hinds, OZ/Gedney, or approved equal.
- G. All wiring systems shall be "pullable" and use of "BX" is prohibited.
- H. Conduits entering motor control center conduit compartments, free standing panels, and free standing control cubicles shall be fitted with jumper type insulated grounding bushings, bonded together and to the structure of the enclosure by a continuous bonding wire.
- I. Conduits and concrete type boxes, masonry boxes, and other flush mounted boxes shall be installed concealed in masonry walls, plaster walls, dry wall and concrete walls.
- J. All concealed conduits shall be placed in walls, floors, ceilings, or ducts at the proper time, in accordance with the progress of the structural work.
- K. Concrete encased conduit runs extending through structural expansion joints shall have fittings permitting longitudinal and lateral movement of the conduit ends without damaging the contained wires. The fittings shall be watertight and include a grounding bond.
- L. Conduit runs that enter the building from outdoors are subject to moisture point of temperature change, to prevent trapping of moisture within the conduit system. A 1/4 inch weep hole shall be drilled in the bottom of the pull box. After the wires and cables are installed, the end of the conduit continuing into the warmer area shall be packed with a non-setting sealing compound.
- M. All communication, telephone, data and computer conduits shall have a minimum separation of 12 inches from any AC power and control conduits.
- N. When work is not in progress, open ends of conduit and fittings shall be securely closed so that no water, earth or other substance will enter.

### 3.02 CONDUIT CONNECTIONS TO EQUIPMENT

- A. The conduit system shall be terminated at the conduit connection point of electric motors, devices, and equipment. Terminations of conduits at such locations shall permit direct wire connections to the motors, devices, or equipment.
- B. Conduit connections shall be made with rigid conduit if the equipment is fixed and not subject to adjustment, mechanical movement, or vibration. Rigid conduit connections shall have union fittings, to permit removal of equipment without cutting or breaking the conduit.
- C. Conduit connections shall be made with approved flexible metallic conduit if the equipment is subject to adjustment, mechanical movement, or vibration. Flexible conduit connections shall be watertight.

### 3.03 OUTLET BOX INSTALLATION

- A. Boxes shall generally be 4 inches square or octagonal except as follows:
  - 1. In masonry walls, where conduit is installed concealed, each box shall be installed square cut masonry boxes.
  - 2. In concrete walls and floor slabs, where conduit is installed concealed, boxes shall be suitable and constructed for installation in concrete.
  - 3. In exposed work, surface outlet boxes shall be used for switches and receptacles.
  - 4. Outlet boxes for use with rigid conduit shall be of the threaded hub, malleable iron cast metal type, with malleable iron cast covers and gaskets.
  - 5. In finished plaster walls, drywall, etc., raised device covers on outlet boxes shall be provided.
  - 6. Where 1 1/4 inch conduits are required, the box size shall be a minimum of 4 11/16 inches square.
- B. Proper covers on boxes mounted flush shall be provided.
- C. All ceiling outlets shall have adequate supports and shall be equipped with adequate devices to carry and mount lighting fixtures provided fixtures do not weigh more than fifty pounds.

- D. An outlet box shall be provided at each device location requiring one.
1. Outlet box locations as shown on the Drawings shall be considered as approximate only.
  2. Exact locations shall be determined from the Drawings or from field instructions. The Contractor shall coordinate box locations with the work of other trades.
  3. Boxes shall be installed true and plumb, so that the covers or plates shall be level and at uniform elevations for the type of outlets contained.
  4. Boxes for toggle switches and pilot lights at doorways shall be located at the strike side of the door.
- E. There shall be no more openings made in any box than are required for the conduits entering same. Depths of boxes shall be such as to allow for easy wire pulling and proper installation of wiring devices.
- F. Switches and receptacles shall be ganged in a common box only where the Drawings so indicate.
- G. Device Boxes:
1. Recessed ceiling fixtures shall have 4 inch square sheet steel box with cover and suitable hanger bar. The box shall be secured to the ceiling suspension members not more than 1 foot from the fixture opening.
  2. Surface mounted ceiling fixtures, for plaster or dry wall ceilings, shall have 4 inch sheet steel octagon box with round opening plaster ring and suitable hanger bar with 3/8 inch fixture stud.
  3. Fixtures which weigh more than fifty pounds shall be supported independently of the outlet box.
  4. Surface mounted wall bracket fixtures (concealed conduit) shall have 4 inch square sheet steel box with plaster ring as required for the fixture.
  5. Ceiling outlets and wall bracket outlets (exposed conduit) in dry locations shall have 4 inch sheet steel octagon box with 3/8 inch fixture stud.
  6. Outlet boxes on exposed conduit run in wet or damp locations shall have 4 inch cast box with threaded hubs and gasketed covers.
  7. Wall switch and receptacle boxes installed in tiled or plastered walls shall have 4 inch square sheet steel boxes or multigang boxes with proper tile or plaster ring as required. Two gang may be provided by means of 4 inch square box with two gang tile or plaster ring.
  8. Wall switch and receptacle boxes in dry locations in brick walls, unfinished walls, woodwork, etc. shall have single or multigang 4 inch square sheet steel boxes.

- H. Plaster rings shall have threaded ears and shall be of suitable depth for the application.
- I. The Contractor shall provide boxes with metal barriers, baffles or separators for grouping of dis similar conductors or system separation.

#### 3.04 PULL BOX INSTALLATION

- A. Pull boxes shall be installed where shown and where necessary to insure that finished cable will not be damaged.
- B. Pull boxes shall be supported independently from the conduit system.
- C. The Contractor shall add pull boxes where needed even though not shown on the Drawings.
- D. Cable Trays:
  - 1. The entire cable tray system shall be installed and supported by devices as shown on the Drawings. A system of preformed galvanized channel members may be used to support cable trays subject to the approval of the Engineer.
  - 2. To prevent fire from spreading between cable trays, the fire resistant blanket, "Flame-Safe" blanket manufactured by Thomas & Betts or approved equal and shall be installed as required whether or not it is shown. For control cable trays, fire resistant blanket shall be installed on top of the cable tray as shown.

#### 3.05 FILLING OF OPENINGS

- A. Where conduit and raceway pass through interior fire-rated walls, ceilings or floors, the Contractor shall provide seals to prevent passage of fire and fumes and to maintain integrity of fire-rated structure.
- B. The Contractor shall close unused openings or spaces in floors, walls and ceilings, and plug or cap all unused conduit and sleeves.
- C. Where conduit passes through walls or floors which are below grade, the Contractor shall provide watertight sealing fittings, OZ/Gedney Type W5K, or Approved Equal.

3.06 IDENTIFICATION

- A. Conduit runs shall be identified as specified under Section 26 19 50 Identification.

3.07 FIELD QUALITY CONTROL

- A. The Contractor shall arrange with the Engineer for inspection and approval of embedded conduit and boxes prior to concrete placement.
- B. The Contractor shall test metallic conduit and boxes for electrical continuity. The tests shall be conducted in presence of the Authority.

END OF SECTION 26 05 00

SECTION 26 10 00  
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and Division 01 Specification sections, apply to this section.
- B. Related work specified elsewhere:
  - 1. Section 26 01 00 General Provisions
  - 2. Section 26 03 00 Electrical Demolition.
  - 3. Section 26 05 00 Raceways and Boxes.
  - 4. Section 26 12 30 Wires, Cables, Splices, Terminations.
  - 5. Section 26 14 10 Wiring Devices.
  - 6. Section 26 17 00 Local Control
  - 7. Section 26 17 50 Local Control Panels
  - 8. Section 26 19 00 Grounding
  - 9. Section 26 19 50 Identification
  - 10. Section 26 47 00 Panelboards
  - 11. Section 26 50 10 Lighting Fixtures
  - 12. Section 26 95 00 Electrical Testing

PART 2 PRODUCTS

2.01 ACCESS PANELS

- A. Where items such as pull boxes, junction boxes, other specialties, or any piece of equipment or device requiring adjustment or service, are concealed in the construction, the Contractor shall furnish an access panel for ceilings or walls to permit adjustment or service of the concealed item. The access panel shall be of a design suitable for installation in the material forming the finished surface in which panel is mounted.
- B. Panels shall be flangeless hinged type with vandal-proof fasteners.
- C. Panels shall be furnished and installed under this Contract.
- D. Acceptable manufacturers shall be Birmingham Ornamental Iron Co., Miami Carey Co. Milcor Division, Inland Ryerson Co. Nystrom, Inc. or approved equal.



## 2.02 EQUIPMENT BASES

- A. The Contractor shall provide concrete pedestals, bases, pads, curbs, anchor blocks, anchor bolts, slab inserts, hangers, channels, cradles, saddles, etc., for installation of all electrical equipment and apparatus that is floor mounted.
- B. Concrete pads shall be 4 inches high, unless otherwise indicated on the Drawings, complete with steel reinforcing and necessary bolts, anchors, etc. Where concrete pad is set directly on concrete floor, dowels in floor to tie base to floor shall be provided. These pads shall be extended at least 4 inches beyond the equipment outlined on all four sides, unless otherwise indicated on the Drawings.

## 2.03 VIBRATION ISOLATION

- A. Suspended vibration producing equipment shall have spring elements in the hanger rods or isolation pads under the equipment.
- B. Conduit connections to vibration producing equipment shall be made with flexible conduit.
- C. Acceptable manufacturers shall be Barry Division of Barry Wright Corp, Consolidated Kinetics Corp., Mason Industries or approved equal.

## 2.04 EXPANSION FITTINGS

- A. The Contractor shall furnish and install expansion fittings and bonding jumpers for the metallic conduit system where conduit crosses each building expansion joint, at each straight uninterrupted run of surface mounted conduit, at each vertical riser in excess of 100 feet and where conduits transfer between structurally independent pipes, poles or supports. The distance between fittings as installed shall not exceed 200 linear feet.
- B. Expansion fittings shall provide for 8 inch movement and shall include bonding jumpers.
- C. Expansion fittings shall be Appleton XJ with XJB jumpers, Crouse Hinds, OZ/Gedney, or approved equal.

## 2.05 FLOOR BOXES AND FITTINGS

- A. Concrete tight floor boxes shall be pressed steel boxes with adjustable brass flange and covers. Acceptable manufacturers shall be Bell F 4052, Hubbell B 2529, or approved equal.

- B. Watertight floor boxes shall be cast iron with adjustable brass flange and covers. Close up plugs and reducing bushings shall be provided as required. Acceptable manufacturers shall be Bell F122 NR, Hubbell B 2537, or approved equal.1

## PART 3 EXECUTION

### 3.01 INSTALLATION - GENERAL

#### A. Interferences:

1. Locations of conduits, fixtures and equipment shall be adjusted and supported to accommodate field conditions encountered, including any potential interferences with other construction or equipment to be installed.
2. The Contractor shall determine the exact route and location of each duct bank and electrical raceway prior to fabrication.

#### B. Accessibility:

1. The Work shall be installed to permit removal (without damage to other parts) of parts requiring periodic replacement or maintenance.
2. Conduits and equipment shall be arranged to permit ready access to components and to clear the openings overhead doors and access panels.
3. The Contractor shall provide necessary access panels in equipment as required for inspection and maintenance.

#### C. Exterior Wall Openings:

1. Openings in exterior walls, particularly at or below grade, shall be kept properly plugged and caulked at all times to prevent the possibility of flooding due to storms or other causes.
2. After completion of the Work, openings shall be permanently sealed and caulked so as to provide leakproof conditions.

### 3.02 SLEEVES

- A. The Contractor shall provide sleeves where conduits pass through walls, floors, partitions as required by the Drawings, and/or job conditions.
- B. Sleeves shall be 18 gauge galvanized sheet metal or plastic, as approved by code, of sufficient length to finish flush with finished surfaces at both ends of sleeves.

- C. Sleeves shall be not less than 1 inch larger than outside diameter of conduit.
- D. Floor sleeves shall be galvanized steel or plastic pipe as approved by code, shall be of sufficient length to finish flush with the top and bottom of the floor, and shall be watertight.
- E. Sleeves through walls, ceilings, and floors, shall have the net openings packed with glass fiber insulation. Each sleeve shall be fire sealed to match the fire rating of the structure they penetrate. Both ends of the sleeves are caulked with waterproof mastic to prevent noise, dirt, air and water transmission.
- F. Where conduits pass through floors on grade or exterior walls, the Contractor shall provide watertight sealing fittings, OZ/Gedney Type WSK or approved equal.
- G. Sleeves shall be set true to line level plumb and shall be so maintained during construction. Where sleeve is provided in poured concrete, the Contractor shall inspect during and after concrete is poured, to insure proper position and to correct any deviation.

### 3.03 PAINTING

- A. All electrical equipment not specified for factory finish painting under other sections of these Specifications shall be painted as specified herein.
- B. Prime Coat:
  - 1. Before delivery to the site, the shop fabricated and factory built equipment, which is not galvanized or protected by plating, shall be cleaned and given one shop coat of zinc chromate primer before delivery to the site.
  - 2. Any portions of the shop coat damaged in delivery or during construction shall be recoated.
  - 3. Nameplates, labels, tags, stainless steel, or chromium plated items such as motor shafts, levers, handles, trim strips, etc, shall not be painted.

C. Finish Coat:

1. Conduit and equipment shall be left cleaned and primed, ready for finish painting provided under the Painting section of this Specification.
2. All equipment shall be factory finished in baked enamel or lacquer, or as specified. Standard finishes shall be approved. All scratches shall be touched up by the Contractor.
3. All metal work installed by the Contractor exposed to weather and not factory finished shall be painted with one coat of red lead, and two coats of lead and oil paint of color selected by the Authority.

3.04 PATCHING

- A. The Contractor shall provide all cutting and patching of building materials required for the installation of the work herein specified.
1. No structural members shall be cut without the approval of the Engineer.
  2. Roof deck is considered a structural member.
  3. Approved cutting shall be done with concrete saws or core drills.
- B. Patching shall be provided by mechanics of the particular trade involved and done in a neat and workmanlike manner.
- C. Slots, chases, and recesses with openings in the walls, ceilings, floors and roofs shall be provided by the Contractor. The Contractor shall see that they are properly located.
- D. Slots, chases, openings and recesses in the structure shall be cut by the Contractor. The Contractor shall patch and repair as required.

3.05 CLEANING

- A. All rubbish and debris resulting from the Work of this SECTION shall be collected, removed from the site and disposed of legally on daily basis.
- B. All floors shall be kept in a broom clean condition.
- C. After completion of the electrical installations the entire system shall be thoroughly cleaned to remove all foreign materials from the conduits, boxes and enclosure, equipment, lighting fixtures, light standards, panels, cords, etc.
- D. Cleaned shall mean the thorough removal of, but not limited to, dust, dirt, oil, grease, cement, plaster, welding spatters and paint spatters.

- E. All cleaning agents and methods shall be in accordance with the electrical equipment manufacturers' recommendations and subject to approval of the Authority.

### 3.06 ALTERATION AND DEMOLITION

- A. A complete and accurate description of all electrical work within the affected areas cannot be accomplished through the media of Drawings and Specifications. Where existing electrical work prevents proper construction of new materials, the Contractor shall remove, reroute, relocate, or in other ways alter the existing work in order to accommodate the new work requirements. Such performance shall be as generally outlined herein and found necessary under field conditions and shall be considered as included under the Contract.
- B. The Drawings are generally instructive of the alterations which involve the existing electrical work. It is not intended that such alterations be limited to these instructions.
- C. Where existing electrical equipment must be removed as a result of the alterations, it shall be completely demolished, back to the first outlet or junction box which is left unaffected by this work. All conduit, wire, supports, hangers, etc. shall be included under this requirement. Conduit which is encased in concrete or otherwise unaccessibly positioned may be abandoned. In such cases wire shall be pulled out of conduit and the conduit itself shall be plugged and capped at each end.
- D. Existing electrical material and equipment, including lighting fixtures, switches, receptacles, conduit outlets, fittings, and other devices which are removed as a result of the alterations shall remain the property of the Authority and shall be stored on the site as directed.
- E. Existing electrical material and equipment with the exception of wire and cable, as generally outlined in the previous paragraph, shall be re-used as completely as is found practical. The Contractor shall examine the condition of such material and equipment and make a prior determination of whether it is suitable for re-use. The Contractor shall present findings periodically to the Engineer who in turn will make the final decision regarding re-usability. Wire and cable shall be new.
- F. Various signal, communications, and other services shall remain in service to provide continuous operation for the Authority's functions. No interruptions of any services will be allowed without written approval from the Authority.

- G. The Contractor shall remove or reroute electrical feeders, risers, branch circuits, and other wiring as required by the alterations or as shown on the Drawings. Wiring extending through remodeled areas but serving loads which must remain shall be rerouted as required, and reconnected to those loads.

END OF SECTION 26 10 00

SECTION 26 12 30  
WIRES CABLES, SPLICES, TERMINATIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and Division 01 Specification sections, apply to this section.

1.02 SUMMARY

- A. This section specifies all wires, cables, splices and terminations as well as appurtenances thereto required under this Contract.

- B. Related work specified elsewhere:

- |     |                  |                                |         |
|-----|------------------|--------------------------------|---------|
| 1.  | Section 26 01 00 | General Provisions             |         |
| 2.  | Section 26 03 00 | Electrical Demolition.         |         |
| 3.  | Section 26 05 00 | Raceways and Boxes.            |         |
| 4.  | Section 26 10 00 | Basic Electrical Materials and | Methods |
| 5.  | Section 26 14 10 | Wiring Devices.                |         |
| 6.  | Section 26 17 00 | Local Control                  |         |
| 7.  | Section 26 17 50 | Local Control Panels           |         |
| 8.  | Section 26 19 00 | Grounding                      |         |
| 9.  | Section 26 19 50 | Identification                 |         |
| 10. | Section 26 47 00 | Panelboards                    |         |
| 11. | Section 26 50 10 | Lighting Fixtures              |         |
| 12. | Section 26 95 00 | Electrical Testing             |         |

PART 2 PRODUCTS

2.01 GENERAL

- A. The Drawings show the locations, type, size and number of wires and cables to be furnished under this Contract. Each type shall comply with the Specifications contained herein.
- B. Only new cables shall be provided. Cables which have been manufactured more than two years prior to installation will not be accepted.
- C. The conductors, unless otherwise noted, shall be soft or annealed copper conforming to ANSI/ASTM B 33 if coated, ANSI/ASTM B 3 if uncoated. In addition, unless otherwise specified, stranded conductors shall have concentric stranding as per ANSI/ASTM B 8.

- D. Cables shall be supplied with both ends of each length sealed against the entry of moisture.

2.02 QUALITY ASSURANCE - AC CABLE

- A. All wires and cables shall be listed by Underwriter's Laboratories, Inc. and shall be copper.
- B. All wire and cable shall be stamped every two feet indicating, voltage, type, temperature rating, manufacturers name, etc., all in conformance with latest applicable standard.
- C. All conductors for wire and cable shall be copper based on 98 percent conductivity according to Mattheisen's Standard.

2.03 MATERIALS - AC WIRE AND CABLE

- A. Wire number 10 AWG and smaller shall be solid, wire number 8 AWG and larger shall be stranded. Control wiring shall be stranded in all sizes and color coded, as approved by the Authority.
- B. All wire Number 6 AWG and smaller, shall have color coded insulation. All wires Number 4 AWG and larger in each, pullbox, outlet, cabinet and every point where wires are accessible or visible, shall be color coded. The same color coding shall be used throughout the entire electrical system.
- C. Color as selected for the purpose of identifying circuits shall be applied to the wire. The colors shall be fast, fadeless and capable of withstanding cleaning in the event that the wire becomes soiled.
  - 1. Green shall be used only for ground wire.
  - 2. All conductors shall be color coded as follows:

240V/208V/120V AC    480/277V AC

Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	White
Ground	Green	Green

- D. All numerical references to wire size in the Specifications and on the Drawings refer to standard American Wire Gauge (AWG), or where so stated, thousands of circular mils (KCMIL).



- E. The Contractor shall submit for approval, before purchase of wire or cable, the following for each type and size to be furnished:
  - 1. Manufacturer of wire, cable.
  - 2. Number and size of strands composing each conductor.
  - 3. Conductor insulation, in 64ths of an inch.
  - 4. Sheath thickness in 64ths of an inch.
  - 5. Average overall diameter of finished cable.
  - 6. Minimum insulation resistance in megohms per 1,000 feet.
  - 7. Representative sample length including all labeling and identification.
- F. The Contractor shall provide wire with thermoplastic insulation type "THWN/AWM." Wire insulation shall consist of a tough, elastic, flexible rubber-like synthetic insulation compound made from 105 degrees C polyvinyl chloride or, its copolymer with vinyl acetate, covered with a nylon jacket. It shall be highly resistant to oil and moisture and shall not be affected by acid or alkali conditions, and marked by UL label as "Gas and Oil Resistant II."
- G. The insulation compound shall be suitable for operating without undue injury or deterioration; under conductor temperatures not exceeding 75 degrees C wet or dry, and 75 degrees C in oil UL rating; and shall be rated 600 volts.
- H. The thermoplastic insulation and nylon jacket shall be applied to the conductor in a manner that will provide continuous walls of uniform thickness, free from defects and of high dielectric strength.
- I. Type "THWN/AWM" insulated wire and cable shall be manufactured and tested in accordance with the requirements of UL and the latest ASTM Specifications for insulated wire and cable, polyvinyl insulation compound and nylon jacket, and shall also comply with IPCEA Standard S-19-81.

#### 2.04 MATERIAL - AERIAL AND UNDERGROUND CABLE, AC SERVICE

- A. Aerial and underground cable shall be single conductor copper. Conductor insulation shall be XLP insulation/jacket, 600V type RHH-RHW-USE. All conductors shall have an overall jacket, resistant to ozone, sunlight and weather.
- B. Cable shall be rated, for continuous full-load operation, 90 degrees C in dry locations or 75 degrees C in wet or dry locations.

2.05 MANUFACTURERS

- A. AC Wire and cables shall be as manufactured by Pirelli, Okonite, Triangle Wire & Cable, or Rome, Product of Cyprus Wire, or Carol Cable - Division of Avnet, or approved equal.

2.06 CABLE SPLICING, TERMINATING AND ARC PROOFING MATERIALS

A. TERMINATIONS - AC WIRES AND CABLES:

1. Special care shall be taken to balance the loads on all phases, at all cabinets. The panelboard schedules show the proper circuiting, the Contractor shall not change this circuiting with out the approval of the Engineer. Distinguishing colors shall be used for identifying the particular phase on which the circuit belongs.
2. 600 volt cable lugs for terminations to busbar, switch studs, and terminal blocks, for Number 22 AWG to 10 AWG wire shall be color coded nylon insulated ring tongue lugs in vibration areas, and spade type in other areas. They shall have a secondary metal sleeve around the wire barrel for insulation strain relief. Type shall be Panduit Pan-Term PN series terminals.
3. Termination for Number 8 AWG to 1/0 AWG wire shall be with standard barrel one hole high conductivity seamless copper lugs with inspection holes to assure adequate wire insertion. The tongue shall be stamped with wire size, UL & CSA logos and manufacturer. The base part number and stud size should also be stamped on the tongue to assure adequate identification in application. Barrels shall contain color coded rings, die color code and/or number. Crimp locations shall be indicated to assure correct installation. For further identification, the manufacturer should also be included on the barrel. Type shall be Panduit Series LCB or LCC Power Connectors or Burndy Type YA, or approved equal.
4. Number 2/0 AWG and larger wire shall be terminated with long barrel, two hole high conductivity seamless copper lugs. Barrels shall contain color coded rings knurled markings indicating die color code, die index numbers, and crimp locations to assure correct usage and installation. For further identification, the manufacturer should also be included on the barrel. For Number 2/0 to 250 MCM sizes, the tongue may be stamped with wire size, UL & CSA logos and manufacturer. The base part number and stud size should also be stamped on the tongue to assure adequate identification in application. Type shall be Panduit LCC series Power Connectors or Burndy Type YA, or approved equal.

B. SPLICES - AC WIRES AND CABLES:

1. Number 10 AWG and smaller wire shall be spliced with insulated butt connectors. Connectors shall contain a center wire stop for adequate wire insertion, translucent nylon insulated housings to insure accurate crimp location, and brazed seam construction for high performance terminations. Type shall be Panduit BSN Pan-Term Butt Splices or 3M "Scotch Lock."
2. Number 8 AWG and larger wire shall be standard barrel, high conductivity seamless copper splices. Barrels shall contain color coded rings knurled markings indicating die color code, die index numbers, and crimp location to assure correct usage and installation. For further identification, the base number and manufacturer should also be included on the barrel. Type shall be Panduit SCS series Power Connectors or 3M "Scotch Lock."
3. Number 10 AWG and smaller wire taps for solid wires shall utilize insulated compression type twist wing or nut style connectors with 105 degrees C, 600 volt rating, for UL listed wire combinations. Connectors shall have a tough nylon housing with a deep skirt to prevent shorts and flashovers, funnel entry to facilitate wire insertion, expanding square wire spring design to ensure reusability, as well as markings to indicate part number UL & CSA logos, and wire range. Nut Style connectors shall be of industry nut style color coding; Blue, Orange, Yellow, and Red (small to large) with comfortable ribs for greater gripping. Industry standard Wing Style color coding shall also be used; Yellow, Red, Blue (small to large), with offset wings to ensure comfort and torquing capability. In addition, black connectors may be used for temperature applications to 150 degrees C and green connectors for grounding applications. Type shall be Panduit "P-Conn" Wire Connectors or 3M "Scotch Lock."
4. Number 10 AWG stranded and smaller, taps shall be made with insulated compression type wire joints. Type shall be Panduit Type JN or approved equal.
5. Number 8 AWG and larger wire taps for stranded wire shall utilize compression taps up through 4/0 AWG wire or parallel gutter taps for larger wire. Taps shall have part number and wire range indicated on the body of the connector. Type shall be Panduit C-Tap Power Connectors or OZ Electrical Type XTP parallel gutter taps.

PART 3 EXECUTION

3.01 INSTALLATION - AC WIRES AND CABLES

- A. Wires and cables shall be carefully handled during installation. Joints and splices shall be made in an approved manner, and shall be equivalent electrically and mechanically to the conductor itself.
- B. Conduit fill shall be based on Chicago Electric Code for "New Work."
- C. All branch circuit and control wiring, in conduit shall be not less than Number 12 AWG wire unless noted otherwise.
- D. Stranded control cables in Number 12 AWG size and smaller shall be terminated into solderless lugs, then lug shall be connected to terminal part.
- E. At least six inch loops or ends shall be left at each outlet for the installation of fixtures or devices.
- F. All wires in outlet boxes not for the connection to fixtures, devices or other wires at that outlet, shall be rolled up and the ends capped or taped.
- G. All circuits in panelboards shall be neatly grouped and tied with seine twine, or nylon wire ties.
- H. No splice or any kind shall be pulled into any raceway. All splices and taps shall be accomplished in a manhole, handhole, junction, pullbox or other accessible enclosure.
- I. Wire and cable shall be delivered to the site in marked manufactures cartons.

3.02 WIRE PULLING LUBRICANT

- A. When necessary to use a lubricant for pulling wires in steel conduit, lubricant shall be UL listed and be of such consistency that it will leave no obstruction or tackiness that will prevent pulling out old wires or pulling in new or additional wires. No soap flakes or vegetable soaps shall be permitted.

### 3.03 TESTING

#### A. Wires and Cables:

1. After wires and cables are in place and connected to devices and equipment, the system shall be tested for shorts and grounds as specified in Section 26 95 00, Electrical Testing.
2. All hot wires, if shorted or grounded, shall be completely removed and replaced in kind.
3. A voltage test shall be made at the last outlet on each circuit. If the drop in potential is greater than permitted by the CEC, the Contractor shall correct the condition by removing and replacing partly grounded connections or reconnecting high resistance splice.
4. All grounds, shorts and high resistance splices shall be remedied immediately at the conclusion of testing for acceptance.
5. Any wiring device, or electrical apparatus provided under this Contract, if grounded or shorted shall be removed, trouble corrected and reinstalled.
6. All high voltage cables, after in place and connected, shall be megged, in presence of the Authority.
7. All meters, cable connections, equipment or apparatus necessary for making all tests shall be furnished by the Contractor at Contractor's own expense. The Contractor shall provide copy of all tests for Authority's approval of result.
8. No work shall be covered up without approval of the Authority.

### 3.04 IDENTIFICATION OF WIRES AND CABLES

#### A. General:

1. All wires and cables, shall be identified by circuits in all cabinets, boxes, manholes, hand-holes, wiring troughs and other enclosures, at all terminal points.
2. The circuit designations shall be as shown on the Drawings, or as directed by the Authority. Tags shall be attached to wires and cables so that they will be readily visible.

- B. Cable/wire markers shall be installed on both ends of all conductors, both for internal and external cables. Cable/wire markers shall be as specified under Section 26 19 50 Identification.

END OF SECTION 26 12 30

SECTION 26 14 10  
WIRING DEVICES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and Division 01 Specification sections apply to this section.

1.02 SUMMARY

- A. This section specifies requirements for the furnishing and installing of wiring devices.
- B. The Contractor shall furnish, install and connect all wiring devices and plates as shown on the Contract Drawings and as hereinafter specified.
- C. All devices shall be heavy duty specification grade conforming to the latest NEMA configurations.
- D. In general all devices shall be one gang wide or wider as required for heavier rated devices.
- E. All devices for wall system outlets shall be supplied by one manufacturer. All furnished device plates shall be supplied by one manufacturer.
- F. All receptacle descriptions given herein are general in nature.
- G. Related work specified, elsewhere includes:
- |     |                  |  |
|-----|------------------|--|
| 1.  | Section 26 01 00 | General Provisions                     |
| 2.  | Section 26 03 00 | Electrical Demolition.                 |
| 3.  | Section 26 05 00 | Raceways and Boxes.                    |
| 4.  | Section 26 10 00 | Basic Electrical Materials and Methods |
| 5.  | Section 26 12 30 | Wires, Cables, Splices, Terminations.  |
| 6.  | Section 26 17 00 | Local Control                          |
| 7.  | Section 26 17 50 | Local Control Panels                   |
| 8.  | Section 26 19 00 | Grounding                              |
| 9.  | Section 26 19 50 | Identification                         |
| 10. | Section 26 47 00 | Panelboards                            |
| 11. | Section 26 50 10 | Lighting Fixtures                      |
| 12. | Section 26 95 00 | Electrical Testing                     |

### 1.03 QUALITY ASSURANCE

- A. The Contractor shall provide devices of the Specifications grade as minimum. Devices shall be of NEMA configuration and shall bear the label of the Underwriters Laboratories.

## PART 2 PRODUCTS

### 2.01 LIGHTING SWITCHES AND TOGGLE SWITCHES

- A. Switches shall be mounted at man-doors where shown on the Drawings, in suitable outlet boxes in the wall or partitions. except where noted on the Drawings.
- B. Switches shall be rated 20 amperes, 120/277 volts ac. The handle of each switch shall be brown or ivory as required by the Authority.
- C. Single pole switches shall be Hubbell Catalog Number CSB 120, Pass & Seymour Catalog Number 20 AC 1, or approved equal. The switch color shall be brown or ivory as approved by the Authority.
- D. Two pole switches shall be Hubbell Catalog Number 1222, Pass & Seymour Catalog Number 20 AC 2, or approved equal. The switch color shall be brown or ivory as approved by the Authority.
- E. Three way switches shall be Hubbell Catalog Number CSB 320, Pass & Seymour Catalog Number 20 AC 3, or approved equal. The switch color shall be brown or ivory as approved by the Authority.
- F. Four way switches shall be Hubbell Catalog Number 1224, Pass & Seymour Catalog Number 20 AC 4, or approved equal. The switch color shall be brown or ivory as approved by the Authority.

### 2.02 CONVENIENCE OUTLETS

- A. Convenience outlets for general use shall be duplex, 3 wire, 20 ampere, 125 volt, NEMA 5-20 R grounding type. Each outlet shall be Number 5362 as made by Pass & Seymour, Hubbell Number CBRF-20, or approved equal. Outlets shall be brown or ivory as approved by the Authority.
- B. Each clock outlet shall be Hubbell Number 5235, Pass & Seymour, or approved equal.

- C. Ground fault circuit interrupters shall be heavy duty, feed through, duplex type rated 20 ampere, 125 volt, incorporating solid state ground fault sensing and signaling, 5 mA trip level. Outlets shall be brown with matching cover plate Hubbell Catalog Number GF 5352, Leviton Catalog Number 6898, Pass & Seymour 2091-S, or approved equal.
- D. Other outlets shall be as called for on the Drawings and as specified herein.

#### 2.03 SWITCH AND RECEPTACLE WALL PLATES

- A. Plates shall be manufactured by the device manufacturer.
- B. In finished areas, plates shall be metal, smooth high abuse, color shall match hardware in surrounding area, as approved by the Authority.
- C. In unfinished areas, plates shall be of the type designed for use with the particular boxes.
- D. In toilets, and utility rooms, plates shall be Type 302/304 nonmagnetic stainless steel.
- E. Jumbo plates shall be used on concrete block walls.
- F. Weatherproof, gasketed, lockable spring type covers shall be provided for weatherproof receptacles. Weatherproof covers shall be Hubbell Catalog Number 5206, Pass & Seymour PS 4510, or approved equal.

#### 2.04 SURGE PROTECTIVE RECEPTACLES

- A. The Contractor shall provide one surge protective receptacle at each computer terminal, in addition to the computer data terminal shown on the Drawings. The color shall be as required.
- B. Each receptacle shall comply with UL 1449 and ANSI/IEEE C 62.41, latest edition.
- C. Each receptacle shall be Hubbell Number 5350 S, Leviton Catalog Number 5380 P, Pass & Seymour Catalog Number 6362 SP, or approved equal.

#### 2.05 SURGE SUPPRESSION RECEPTACLES WITH ISOLATED GROUND

- A. The Contractor shall provide duplex surge suppression receptacles with isolated ground as shown on the Drawings. Each receptacle shall be provided with a power-on indicator light and audible alarm. The audible alarm shall energize when the surge protection is no longer functioning, and shall keep alarming until the module is replaced.



- B. Each surge suppression receptacle shall be UL listed to standards 1449 and 498 and CSA certified, (NEMA 5-15 R configuration only) and shall comply with ANSI/IEEE C 62.41, latest edition.
- C. The rating shall be shown on the drawings. The color shall be as required.
- D. The receptacles shall be manufactured by Eagle Catalog Number IG 1210, Hubbell Catalog Number IG-5252-S and Catalog Number SM-D 125, color as required, or approved equal.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Wall switches and receptacles shall be located where indicated on the Drawings, arranged singly or in gangs and at the height specified or indicated and shall have approved plates and finishes as specified herein.
- B. The Contractor shall install the equipment in strict accordance with the approved shop drawings and the equipment manufacturer's recommendations.
- C. The Contractor shall adjust the location of equipment to accommodate the work in accordance with field conditions encountered.
- D. Provide rust-resistant mounting hardware for all wiring device boxes.
- E. Receptacles on single outlet branch circuits shall be the same rating as the branch circuit overcurrent protection.
- F. The Contractor shall install wall switches with OFF position down.
- G. The Contractor shall derate wall dimmers as instructed by the equipment manufacturer. The use of common neutral is not acceptable.

The Contractor shall install each convenience receptacle with the grounding pole on bottom when mounted vertically or on the right when mounted horizontally.

- I. The Contractor shall install plates on all switch, and receptacle outlets and shall install blank plates on all unused boxes.
- J. The Contractor shall install devices and plates flush and level.
- K. The Contractor shall seal all connections on GFCI with seal coat compound and wrap with two layers tape.

- L. Each switch shall be mounted 4 feet 0 inches above the finished floor. Each receptacle shall be installed 1 foot 6 inches above finished floor, or unless shown otherwise on the Drawings.
- M. Each receptacle and switch shall be side wired. Back wiring is not acceptable.
- N. Receptacles installed in areas accessible to the public shall be equipped with lockable covers.

3.02 PERFORMANCE TESTING

- A. The Contractor shall test the complete wiring device installations to assure proper operation.
- B. The Contractor shall test each ground fault interrupter to demonstrate each circuit trips between 2 to 5 milliamperes.

END OF SECTION 26 14 10

SECTION 26 17 00  
LOCAL CONTROL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and other specification sections apply to this section.

1.02 SUMMARY

- A. This Section specifies requirements for the furnishing and installing of local control for this project.
- B. The Contractor shall furnish and install the disconnect switches, circuit breakers, fuses, motor starters, and control devices for local control as shown on the Drawings.
- C. Related work specified elsewhere:

- |     |                  |  |
|-----|------------------|--|
| 1.  | Section 26 01 00 | General Provisions                     |
| 2.  | Section 26 03 00 | Electrical Demolition.                 |
| 3.  | Section 26 05 00 | Raceways and Boxes.                    |
| 4.  | Section 26 10 00 | Basic Electrical Materials and Methods |
| 5.  | Section 26 12 30 | Wires, Cables, Splices, Terminations.  |
| 6.  | Section 26 14 10 | Wiring Devices.                        |
| 7.  | Section 26 17 50 | Local Control Panels                   |
| 8.  | Section 26 19 00 | Grounding                              |
| 9.  | Section 26 19 50 | Identification                         |
| 10. | Section 26 47 00 | Panelboards                            |
| 11. | Section 26 50 10 | Lighting Fixtures                      |
| 12. | Section 26 95 00 | Electrical Testing                     |

PART 2 PRODUCTS

2.01 MATERIALS

- A. The Contractor shall provide the required disconnect switches, circuit breakers, fuses, motor starters, and control devices as shown on the Drawings and as required in other Sections of these Specifications.
- B. All enclosures for the local control equipment shall be NEMA 12 for indoor locations and NEMA 4X stainless steel for outdoor locations.

## 2.02 SAFETY SWITCHES

- A. Safety switches shall be, heavy duty type, rated at 600 volts for 480 volts AC and 250 volts AC for 208 volts AC and 120 volts AC circuits.
- B. Each safety switch shall be heavy duty, horsepower rated, fusible or non-fusible as required.
- C. Each safety switch shall have an external handle that can be padlockable in the "OFF" position. The handle operation shall be non-teasible, quick make-quick break.
- D. Safety switches shall be provided with copper lugs and ground lugs. In addition, fusible switches shall be provided with rejection style fuse clips.
- E. Noncorrosive nameplates shall be laminated plastic with 3/8 inch black letters on a white background and shall be mechanically affixed to the front of each door with self tapping stainless steel screws. This shall not change the NEMA rating of the enclosure.
- F. Acceptable disconnect switch manufacturers shall be Siemens/ITE, Cutler-Hammer, Square "D" or approved equal.

## 2.03 FUSES

- A. The Contractor shall furnish and install fuses for all fusible equipment provided on this Project regardless of which trade has provided such equipment. All fuses shall be provided in accordance with the indications of size and voltage ratings given on the Drawings and shall have UL and NEC approval as being suitable protection for conductors under overload conditions.
  - 1. All fuses shall be of the same manufacturer.
  - 2. No paralleling of fuses will be permitted.
- B. Fuses shall be Bussman RK-1, Fusetron, DualElement time delay fuses or approved equal; shall be Underwriters' Laboratories listed Class "RK-5" fuses having an interrupting rating of 200,000 amperes.
- C. Fuses shall be dual-element with a separate thermal element that will open at 280 degrees F or less; and shall have time-delay such that they will hold 500 percent rated current for a minimum of ten seconds in all sizes.
- D. The Contractor shall check each motor nameplate data and provide proper fuses for motor running protection.

- E. Spare fuses shall be furnished in the ratio of ten percent of each size and type installed, but not less than three of each size and type. All fuses blown during construction shall be replaced by the Contractor, and a complete supply of spare fuses shall be turned over to the Authority upon completion of the Project.
- F. Fuses shall be manufactured by Bussman, GEC Alsthom, or approved equal.

#### 2.04 CONTROL DEVICES

- A. Pushbutton stations, selector switches, etc. shall be heavy duty oil tight type and UL approved and the enclosures shall be NEMA rated for the area in which they are installed.
- B. Acceptable manufacturers shall be Siemens/ITE, Cutler-Hammer, Allen Bradley, or approved equal.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. The Contractor shall install the equipment in strict accordance with the approved shop drawings and the equipment manufacturer's recommendations.
- B. The Contractor shall adjust the location of equipment to accommodate the work in accordance with field conditions encountered.
- C. The equipment shall be installed with work space clearances required by the Code.
- D. The equipment shall be installed to permit maintenance and replacement of parts, and shall be clear of all openings with swinging or moving doors, partitions or access panels.
- E. Safety switches and circuit breakers shall be installed 5 feet, 0 inches above finished floor unless shown otherwise on the Drawings.
- F. The Contractor shall provide a non-fused disconnect switch in accordance with the City of Chicago Electrical Code for each motor.

#### 3.02 PERFORMANCE TESTING

The Contractor shall test the complete local control installations to assure proper operation and correct sizing of all motor overload units and/or fuses.

END OF SECTION 26 17 00

SECTION 26 17 50  
LOCAL CONTROL PANELS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and Division 01 Specification sections apply to this section.

1.02 SUMMARY

- A. This section specifies requirements for the furnishing and installing of local control panels. The work under this section includes furnishing all labor, materials, tools, equipment and incidentals necessary to install the local control panels.
- B. The Contractor shall furnish and install the local control panels as required by other Sections of these Specifications and as shown on the Drawings.
- C. Related work specified elsewhere:

- |     |                  |  |
|-----|------------------|--|
| 1.  | Section 26 01 00 | General Provisions                     |
| 2.  | Section 26 03 00 | Electrical Demolition.                 |
| 3.  | Section 26 05 00 | Raceways and Boxes.                    |
| 4.  | Section 26 10 00 | Basic Electrical Materials and Methods |
| 5.  | Section 26 12 30 | Wires, Cables, Splices, Terminations.  |
| 6.  | Section 26 14 10 | Wiring Devices.                        |
| 7.  | Section 26 17 00 | Local Control                          |
| 8.  | Section 26 19 00 | Grounding                              |
| 9.  | Section 26 19 50 | Identification                         |
| 10. | Section 26 47 00 | Panelboards                            |
| 11. | Section 26 50 10 | Lighting Fixtures                      |
| 12. | Section 26 95 00 | Electrical Testing                     |

1.03 SUBMITTALS

- A. The Contractor shall prepare and submit to the Authority, for review, before fabrication and assembly of equipment, one mylar and six prints of each of the following:
1. Front and interior elevations shall be provided as required to show all equipment for each control panel.
  2. Drawings and section views shall include all dimensions for rough in work at the site.

3. The shop drawings shall show the details of connections, terminals, etc. including the complete terminal block arrangement and enclosure ground connections.
  4. Single line diagrams where required to show equipment power distribution and control schematic diagrams shall be provided.
  5. Wiring Diagrams:
    - a. Connection diagrams for the wiring of equipment in each local control panel shall be provided.
    - b. Interconnection diagrams shall show the wiring to external equipment. The terminal block points shall be clearly identified for the external wiring to be routed in or out of each local control. The wiring diagrams shall provide adequate space at the terminal blocks for the addition of cable and wire designations.
  6. Bills of material shall include all items with catalog cuts describing the electrical and physical characteristics of each item.
- B. The Contractor shall submit, for record and distribution, prior to shipment of equipment, five copies of each of the following for each local control panel.
1. All drawings shall be as finally reviewed and shall include any factory assembly modifications.
  2. Recommended installation and storage instructions with any special instructions shall be provided.
- C. The Contractor shall submit, for record and distribution, prior to shipment of equipment, five copies of each of the following for each local control panel assembly.
1. Instruction manuals shall include descriptive bulletins and operation leaflets for the control relays, switches, starters, and circuit breakers.
    - a. Each instruction manual shall be in a three ring hard binder with tabbed sections. The binder cover shall have the project name and equipment name. The lettering shall be block type and shall be a minimum height of 1/2 inch.
    - b. Each instruction manual shall contain the "Record Document" drawings, complete operating and instruction manuals, spare parts lists, certified test documents, and other special data required for this equipment.
    - c. The "Record Document" drawings larger than 8 1/2 by 11 inch shall be fan folded.
  2. Spare parts bulletins shall be included with catalog cuts for each item.

3. For large projects control panel instructions can be combined with other project material instructions.
  4. Certified test reports shall include all assembly and subassembly test and inspection reports.
- D. The Contractor shall submit five copies of any shop drawings and other data sheets that were revised or modified during installation. These will be inserted in the previously submitted instruction manuals.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Local control panels furnished by the supplier of the equipment, and or the Contractor and shall conform with the requirements specified herein.
- B. Each local control panel shall be UL listed.
- C. All enclosures for the local control panels installed indoors shall be NEMA 12 and NEMA 4X stainless steel when installed outdoors.
- D. Enclosures shall be wall-mounted single-door, NEMA Type 12, with back panels, similar to Hoffman Engineering Company Type A-12 or equal, as shown in the Contract Drawings, with the following additional requirements:
  1. Enclosures shall be formed of 12-gauge galvaneal sheet steel minimum, seams continuously welded and ground smooth, without openings or knockouts, with threaded conduit entrance hubs, lugs for mounting enclosure, and collar studs for mounting panel. A rolled lip shall be formed on all sides of the door opening. Enclosure and door shall be reinforced when size exceeds 30 inches square. Size shall be as shown on the Drawings.
  2. Doors shall be formed of 12-gauge sheet steel with rolled lip along top and sides to mate with the enclosure. The door shall be fitted with a removable print pocket and a closed-cell neoprene gasket attached with oil-resistant adhesive and steel retaining clips.



3. Cabinet door shall be equipped with a concealed full length, stainless steel continuous piano type hinge. Yale Company, Division of Eaton Security Products & Systems, Catalog Number S 1400, or Corbin Cabinet Lock Company Catalog Number 1000 vault handles with disc tumbler locks and three point latch shall be provided on doors twenty-four inches or over in height. Yale Company, Division Eaton Security Product & Systems Catalog Number T 1403, or Corbin Cabinet Lock Company Catalog Number 1001 handles with disc tumbler locks and one point latch shall be provided on doors under twenty-four inches in height.
  4. Two keys shall be furnished with each cabinet and lock. All cabinet locks shall be provided to accept a CAT 60 Master Key (Corbin Lock or H. Hoffman Co.). Lock shall be arranged to permit key removal in locked and unlocked positions.
  5. For NEMA 4X requirements, enclosure including door and back panel shall be stainless steel. The cabinet shall be Type 304 stainless steel.
  6. Enclosures under 24" can be constructed from 14 gauge galvaneal steel.
- E. Each NEMA Type 4X stainless steel enclosure, or enclosures located outdoors or in unheated areas, shall have thermostatically controlled space heaters.

## 2.02 DISCONNECT SWITCHES AND CIRCUIT BREAKERS

- A. Disconnect switches shall be heavy duty type, rated at 600 volts for 480 volt AC circuits and 250 volts for 208 volt AC and 120 volt AC circuits. Each disconnect switch shall be horsepower rated.
- B. Circuit breakers, shall be rated at 600 volts for 480 volt AC circuits and 250 volts AC for 208 volts AC and 120 volts AC circuits.
- C. Circuit breakers shall be the heavy duty industrial type. Circuit breakers for 480 volt and 277 volt service shall have a minimum frame size of 100 amperes and shall be rated for 600 volts. The trip settings shall be as shown on the Drawings. The breaker interrupting rating shall be 65,000 amperes, symmetrical at 480 volts AC.
- D. Circuit breakers for 120 volt and 208 volt service shall be 240 volt rated, shall be of the "bolt on" type and shall have an interrupting rating of 65,000 amperes at 240 volts AC. The trip settings shall be as required or as shown on the Drawings.
- E. Circuit breakers provided for motor circuit protection shall be of the motor circuit protector type, sized to coordinate with the motor starter overloads.
- F. Acceptable circuit breaker and disconnect switch manufacturers shall be Square D, Cutler-Hammer, Siemens, or approved equal.

## 2.03 CONTACTORS

- A. Contactors shall be heavy duty type, rated 600 Volts, electrically held, and the number of poles shown on the Drawings.
- B. Acceptable manufacturers shall be Square D, Cutler-Hammer, or approved equal.

## 2.04 CONTROL DEVICES

- A. Pushbuttons, selector switches, indicating lights, etc. shall be heavy duty oil-tight type and UL approved. Enclosures shall be NEMA rated for the area in which they are installed.
- B. Pilot lights shall be heavy duty, oil-tight, LED type with red (on) and green (off). A push to test circuit shall be provided when more than two lights are required.
- C. Acceptable manufacturers shall be Allen Bradley, Siemens/ITE, Cutler-Hammer, or approved equal.

## 2.05 DOOR SWITCHES

- A. Provide security type magnetic door switches and associated wiring where shown on the Drawings.
- B. Door switches shall be of the concealed type, 3/4 inch diameter, with plated Rhodium contacts. Door switches shall be Simplex 27760-9000 series or approved equal.

## 2.06 NAMEPLATES

- A. A nameplate shall be provided on the exterior of each panel to describe the panel and equipment it serves.
- B. The name of the driven equipment shall appear on each starter and breaker.
- C. Non-corrosive nameplates shall be laminated plastic with 3/8 inch black letters on a white background and shall be mechanically affixed to the front of each door with self tapping stainless steel screws. This shall not change the NEMA rating of the enclosure.
- D. Nameplates shall be installed to designate the purpose of all switches, breakers, instruments, relays, fuses, etc.

## 2.07 CABLE, TERMINATIONS, AND CABLE TAGGING

- A. Compression type cable lugs for terminating cables and equipment within the panel and entering and leaving the panel shall be furnished by the equipment manufacturer. Copper compression connectors shall be crimp, type, long barrel tin plated closed end compression. All connectors shall be copper. The barrel for each cable lug shall be sized for the exact cable size specified. Copper type connectors and terminations shall be furnished. Copper-Aluminum connectors are not acceptable. Connectors shall be Burndy Type YA, Panduit Series LCB or LCC, Anderson Type VHCL, T & B Series 54800 and 54900, or approved equal.
- B. Cable lugs for terminations to busbar, switch studs, terminal blocks, and other devices, for Number 22 AWG to 10 AWG wire shall be 600 Volt, color coded nylon insulated ring tongue lugs. They shall have a secondary metal sleeve around the wire barrel for insulation strain relief. Type shall be Panduit Pan-Term PN series terminals. Locking fork-type lugs can be used for connections to devices provided with captive fasteners.
- C. Cable lugs for terminations of Number 8 AWG to 1/0 AWG wire shall be standard barrel, one hole high conductivity seamless copper lugs, with inspection holes to assure adequate wire insertion. The tongue shall be stamped with wire size, UL & CSA logos and manufacturer. The base part number and stud size should also be stamped on the tongue to assure adequate identification in application. Barrels shall contain color coded rings, die color code and/or number. Crimp locations shall be indicated to assure correct installation. For further identification, the manufacturer should also be included on the barrel. Type shall be Panduit Series LCB or LCC Power Connectors or Burndy Type YA, or approved equal.
- D. Cable lugs for terminations of number 2/0 AWG and larger wire shall be long barrel, two hole high conductivity seamless copper lugs. Barrels shall contain color coded rings knurled markings indicating die color code, die index numbers, and crimp locations to assure correct usage and installation. For further identification, the manufacturer should also be included on the barrel. For Number 2/0 to 250 MCM sizes, the tongue may be stamped with wire size, UL & CSA logos and manufacturer. The base part number and stud size should also be stamped on the tongue to assure adequate identification in application. Type shall be Panduit LCC series Power Connectors or Burndy Type YA, or approved equal.
- E. Cable/wire markers shall be installed on both ends of all conductors, both for internal and external cables. The cable/wire markers shall comply with Section 26 19 50 Identification.

## 2.08 CONTROL DEVICES AND WIRING

- A. Control devices, local instrument cables, and wiring required on the equipment shall be furnished and installed at the factory.
- B. All small wiring for control or accessory equipment shall be installed in code approved wireways.
- C. Control panel internal wiring shall be Number 14 AWG, minimum, except for incidental wiring on mass produced pre-manufactured sub-assemblies or where larger size conductors are needed for current carrying requirements. The conductors shall be stranded copper for fixed wiring and extra flexible copper for hinged wiring. The conductors shall have 600 volts, 90 degrees C, polyvinyl chloride insulation with flameproof braid covering, Type TBS, or cross-linked polyethylene, Type SIS.
- D. All control and instrument wiring, alarm leads, and instrument transformer secondaries, for connection to external cables, shall be terminated at terminal blocks. Terminal blocks shall be barriered molded blocks, 600 volt and 30 ampere rated, screw type, with washer head screws and shall be provided for terminating all small wiring. Acceptable terminal block manufacturers shall be Cutler-Hammer, Buchannan, or approved equal.
- E. Compression, type (solderless) copper lugs shall be furnished for each terminal block for external control and instrument wires. Minimum field wire size shall be AWG No. 12. Cable lugs for terminations to busbar, switch studs, terminal blocks, and other devices, for Number 22 AWG to 10 AWG wire shall be 600 Volt, color coded nylon insulated ring tongue lugs. They shall have a secondary metal sleeve around the wire barrel for insulation strain relief. Type shall be Panduit Pan-Term PN series terminals. Locking fork-type lugs can be used for connections to devices provided with captive fasteners.
- F. Cable/wire markers shall be installed on both ends of all conductors both for internal and external cables. The cable/wire markers shall comply with Section 16195 Identification.
- G. Control cables shall be neatly routed and supported in cable duct within the cabinet.
- H. The assembled control equipment, wiring and connections shall be insulated for a voltage of 600 volts and shall be subjected to a one minute test of 2200 volts AC phase to ground at the factory, after fabrication and assembly is complete.

- I. Spare fuses shall be provided mounted in the assembly.
- J. The assembled control equipment shall be provided with UL 508 industrial control label or equal.

#### 2.09 TESTING

- A. The assembled control equipment, wiring and connections shall be insulated for a voltage of 600 volts and shall be subjected to a one minute test of 2200 volts AC phase to ground at the factory, after fabrication and assembly is complete.

#### 2.10 PAINTING

- A. All interior and exterior seams shall be carefully filled and sanded smooth for neat appearance. The equipment manufacturer shall remove oils and dirt and form a chemically and anodically neutral conversion coating, to improve the finish-to-metal bond, and to provide resistance to rust. All surfaces shall be phosphatized before any of the protective coatings are applied. The final coat for non-stainless steel surfaces shall be baked semi-gloss enamel to provide adhesion, resiliency, durability, color stability, and stain resistance.
- B. The exterior surface of all non stainless steel structures shall be thoroughly cleaned and given a coat of primer and a finish coat of the equipment manufacturer's standard of ANSI Standard light gray color Number 61 for outside surface.
- C. The interior surface of all non stainless steel surfaces shall be given a primary coat and a finish coat of ANSI Standard light gray color Number 61.
- D. Sub pans shall be painted white.
- E. The equipment manufacturer shall provide an adequate supply of touch-up paint in aerosol cans.
- F. A packaged kit of refinishing materials, with complete instructions, shall be included with each shipment for touch-up in the field.

#### 2.11 MANUFACTURERS

- A. Each local control panel shall be assembled and manufactured by Berthold Electric Company, Illinois Switchboard Corporation, Panatrol, Perigon Systems, Inc., Siemens/ITE, Cutler-Hammer Electric, or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

- A. The Contractor shall install the equipment in strict accordance with the approved shop drawings and the equipment manufacturer's recommendations.
- B. The Contractor shall adjust the location of equipment to accommodate the work in accordance with field conditions encountered.
- C. The equipment shall be installed with work space clearances required by the Chicago Electrical Code.
- D. The equipment shall be installed to permit maintenance and replacement of parts, and shall be clear of all openings with swinging or moving doors, partitions or access panels.
- E. Mounting bases for floor mounted control panel:
  - 1. The Contractor shall install each floor mounted control panel on a 4 inch thick concrete housekeeping pad of sufficient size plus at least a 4 inch apron. Panels mounted in rooms with slabs on grade shall have a non-conductive fiberglass mat installed between the panel and the concrete pad. Anchor bolts or fasteners shall comply with the Authority's requirements for isolated connections.
  - 2. Each foundation shall be level, stable, and compacted to 95 percent Standard Proctor.
  - 3. Conduit locations shall be in accordance with equipment manufacturer's approved shop drawings.
- F. Wall Mounted Control Panel:
  - 1. Each wall mounted control panel shall be supported and mounted away from the wall with "C" shaped channel. The channel shall be fiberglass, when stray current control isolation is required, and stainless steel for normal applications. The minimum separation between the equipment and the wall shall be one inch.
  - 2. Each control panel shall be mounted with the top a maximum of 6 feet 6 inches above the finished floor.

3.02 PERFORMANCE TESTING

- A. The Contractor shall test each complete local control panel installation to assure proper operation and correct sizing of all control fuses and motor overload units.

END OF SECTION 26 17 50

SECTION 26 19 50  
IDENTIFICATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and Division 01 Specification sections apply to this section.

1.02 SUMMARY

- A. This Section specifies equipment, wire and conduit identification.
- B. Related work specified elsewhere:

- |     |                  |  |
|-----|------------------|--|
| 1.  | Section 26 01 00 | General Provisions                     |
| 2.  | Section 26 03 00 | Electrical Demolition.                 |
| 3.  | Section 26 05 00 | Raceways and Boxes.                    |
| 4.  | Section 26 10 00 | Basic Electrical Materials and Methods |
| 5.  | Section 26 12 30 | Wires, Cables, Splices, Terminations.  |
| 6.  | Section 26 14 10 | Wiring Devices.                        |
| 7.  | Section 26 17 00 | Local Control                          |
| 8.  | Section 26 17 50 | Local Control Panels                   |
| 9.  | Section 26 19 00 | Grounding                              |
| 10. | Section 26 47 00 | Panelboards                            |
| 11. | Section 26 50 10 | Lighting Fixtures                      |
| 12. | Section 26 95 00 | Electrical Testing                     |

PART 2 PRODUCTS

2.01 EQUIPMENT IDENTIFICATION

- A. After finish painting is completed, the Contractor shall provide white with black core laminated phenolic nameplates with 3/8 inch lettering etched through the outer covering. Each nameplate shall be fastened with stainless steel screws to each piece of equipment, in a way that will not void the NEMA rating for the enclosure.
1. All major electrical equipment shall be identified which shall include motor starters, disconnect switches, panelboards, transfer switches, transformers etc.
  2. Disconnect switches serving feeders and overcurrent protective devices mounted in a switchboard shall also be identified.
- B. Embossed self-adhering plastic tape labels will not be accepted.

## 2.02 WIRE IDENTIFICATION

- A. Cable/wire markers shall be installed on both ends of all conductors.
- B. All wire and feeder cables shall be labeled with wire markers in all junction boxes, pull boxes, control panels, motor control centers, panelboards, switchboards, etc.
- C. Wire and cable markers shall be self adhesive, self laminating mechanically printed with a clear protective laminating over wrap or mechanically printed with a clear protective laminating over wrap or mechanically printed heat shrink tubing. Cable and wire markers shall be approved by the Engineer and shall be attached to all cables where entering or leaving the conduit run. The cable designation and circuit use shall appear on the tag.
- D. Acceptable manufacturers shall be Brady, Panduit, 3-M, Thomas and Betts, or approved equal.

## PART 3 EXECUTION

### 3.01 EQUIPMENT IDENTIFICATION

- A. Each nameplate shall include the equipment designation as shown on the Drawings, as approved by the Engineer, and other information as required in the Specifications.
- B. The Contractor shall provide the following identification markings on each individually mounted circuit breaker, disconnect switch, contactor, and motor starter:
  - 1. Feeder name, number, voltage and phase.
  - 2. Item of equipment controlled.
- C. The Contractor shall provide the following identification markings on each motor and other utilization equipment, except lighting fixtures:
  - 1. Equipment tag designation.
  - 2. Feeder number
  - 3. Voltage and phase.
- D. The Contractor shall provide the following identification markings on each transformer:



1. Equipment tag designation.
  2. Feeder number
  3. Voltage and phase.
  4. Name of lighting and/or power panels supplied by the secondary of the transformer.
- E. The Contractor shall provide a typewritten directory of circuits in lighting and power panels and provide panel identification in black alkyd paint stenciled inscriptions on the inside of the door, directly above the centerline of directory frame, or on vertical and horizontal centerline of doors without directory frames.
- F. The Contractor shall provide on device plates for local toggle switches, toggle switch type manual starters, pilot lights, and other electrical items whose function is not readily apparent, engraved suitable inscriptions on laminated phenolic nameplates describing the equipment controlled or indicated.
- G. Each nameplate shall be fastened with a minimum of two self tapping stainless steel screws. This shall not change the NEMA rating of the enclosure.
- H. The Contractor shall provide the following alkyd paint stenciled inscription markings on the outside face and on the inside face of each feeder splice box, feeder junction box, and feeder pull box cover plate:
1. Designation shown on the Drawings.
  2. Feeder name.
  3. Feeder number.
  4. Voltage and phase.

### 3.02 CONDUIT, WIRE, CABLE AND BUS IDENTIFICATION

- A. Each wire and each cable shall be labeled at terminals and at all accessible points in equipment, panelboards, manholes, handholes, and pull boxes. Labels shall be self-sticking wire markers.
- B. Each cable run shall be assigned a circuit number and shall be recorded on a cable schedule showing from, to, purpose, number of conductors and length.
- C. Cable/wire wire markers shall be the wrap-around self-adhesive type, with factory or mechanical printed numbers, letters and symbols which shall be used to identify all feeders, mains and branch circuit conductors.
- D. All conductors shall be tagged in cabinets at the time wires are pulled in and tested and markers shall not be removed for any reason.

- E. Phase identification letters, in readily visible locations, shall be stamped into the main bus bars of switchboards and panelboards.

3.03 ROOM IDENTIFICATION

- A. On each interior wall of each electrical room, the Contractor shall provide a vitreous enameled metal sign or plastic sign, red on white, reading "Electrical Equipment Room - No Storage Permitted". Letter font size shall be one inch. Signs shall be mounted at clearly visible locations within the rooms or on the inside of doors where wall space within the room is not available.
- B. Each sign shall be manufactured by Panduit, or approved equal.

END OF SECTION 26 19 50

SECTION 26 95 00  
ELECTRICAL TESTING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and Division 01 Specification sections apply to this section.

1.02 SUMMARY

- A. This section of Specification covers the tests and checks that shall be made on all electrical equipment and wiring to ensure compliance with the applicable codes and standards and with the Drawings and Specifications.

- A. Related work specified elsewhere:

- |     |                  |  |
|-----|------------------|--|
| 1.  | Section 26 01 00 | General Provisions                     |
| 2.  | Section 26 03 00 | Electrical Demolition.                 |
| 3.  | Section 26 05 00 | Raceways and Boxes.                    |
| 4.  | Section 26 10 00 | Basic Electrical Materials and Methods |
| 5.  | Section 26 12 30 | Wires, Cables, Splices, Terminations.  |
| 6.  | Section 26 14 10 | Wiring Devices.                        |
| 7.  | Section 26 17 00 | Local Control                          |
| 8.  | Section 26 17 50 | Local Control Panels                   |
| 9.  | Section 26 19 00 | Grounding                              |
| 10. | Section 26 19 50 | Identification                         |
| 11. | Section 26 47 00 | Panelboards                            |
| 12. | Section 26 50 10 | Lighting Fixtures                      |

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. The Contractor shall test the equipment. The Contractor shall contact the Authority two (2) weeks prior to the testing to provide sufficient notice for scheduling a representative of the Authority to be present for the testing.
- B. Whenever possible, all checks and tests shall be made just prior to energizing the equipment or circuits and shall be coordinated with the field schedule and field conditions.

- C. Before testing and energizing a system, all necessary precautions shall be taken to ensure the safety of personnel and equipment. All conductors and all electrical equipment shall be properly insulated and enclosed. All enclosures for conductors and equipment shall be properly grounded. Insulation resistance measurements shall have been made and approved on all conductors and energized parts of electrical equipment.

### 3.02 TESTING

- A. The following tests are required but shall not be limited to this list. Tests will be supervised and witnessed by the Authority.
  - 1. Proper phase rotation.
  - 2. Short circuits.
  - 3. Improper grounds.
  - 4. Power and control electrical circuits for circuit continuity and function test.
- B. The Contractor shall furnish all meters, instruments, cable connections, equipment or apparatus necessary for making all tests.

### 3.03 TESTS

- A. The Contractor shall check and test all transformers, power panels, feeders, power and control cables, connections and motors to assure correct phase sequence and rotation. Phase sequence shall be A B C as follows:
  - 1. Top to bottom, left to right and front to rear when facing protective or disconnecting mechanism.
  - 2. Phasing shall be accomplished by using distinctive colors for various phases, as indicated in Section 16123 Wires, Cables, Splices, Terminations.
- B. After wires and cables are in place and connected to devices and equipment, the system shall be tested for short circuits, improper grounds, and other faults. If fault condition is present, the trouble shall be rectified and the wiring system shall be retested.
- C. Phase conductors, if shorted, grounded or at fault shall be removed, shall be replaced and the wiring system shall be retested.

- D. A voltage test shall be made at each lighting panel, distribution panel and at the last outlet on each circuit. If drop in potential exceeds one percent, the Contractor shall correct the condition by locating the ground or high resistance splice or connection and retest.
- E. Any wiring device, electrical apparatus, or lighting fixture grounded or shorted on any integral "live" part, shall be removed and the trouble rectified by replacing the defective parts or materials.
- F. Upon completion of the electrical work, the Contractor shall place the entire installation in operation, test for proper function, and show systems and equipment to be free of defects. Motors and driven equipment shall not be run until properly lubricated. Pumps shall not be run until water or process fluid supply is connected and turned on. The Contractor shall test and record motor maximum load amperage and terminal voltage when uncoupled and coupled for each motor.
- G. The Authority will conduct from time to time such tests as may be required to any part of the equipment to determine if it is installed in accordance with specifications. The Contractor shall extend to the Authority all facilities to this end and shall furnish skilled or unskilled help required.
- H. All tests shall be witnessed by the Authority and three copies of the verified test results shall be given to the Engineer promptly upon completion of a test.
- I. The Contractor shall provide assistance to the various equipment manufacturers' field engineers as required in the testing and adjusting of the electrical power and control equipment. Cooperation of the Contractor shall be such that a minimum of time is required for equipment testing.
- J. A log shall be maintained for all tests. This log shall be certified before completion of the job, both as to test value and date of test. All major equipment such as switchgear, and motors shall be energized initially in the presence of the Authority.
- K. Any faults in the work performed by this Contractor or in materials or equipment furnished by this Contractor shall be corrected or replaced promptly by this Contractor at Contractor's own expense. Any faults in materials or equipment furnished by the Contractor which are the result of careless, incompetent or improper handling or installation by this Contractor shall be corrected or replaced promptly by this Contractor at Contractor's own expense.

L. All tests shall be made at the Contractor's expense and certification of the tests shall be submitted to the Engineer. If any failures occur during the tests, the Contractor shall replace the cable.

M. All tests shall be recorded on the following forms:

<u>Form Number</u>	<u>Description</u>
26 95 00-1	MULTIPLE CONDUCTOR CABLE MEGGER TEST, 300 VOLTS & LESS.
26 95 00-2	SINGLE & MULTIPLE CONDUCTOR POWER CABLE MEGGER TEST, 600 V AND LESS.

FORM 26 95 00 - 1

MULTIPLE CONDUCTOR CABLE MEGGER TEST, 300 VOLTS & LESS

WIRING - SIGNAL & COMMUNICATION CABLE

Testing shall be performed before connecting the cables to the terminals at either end. Continuity of each conductor shall be checked at this time.

Each conductor shall be checked with a 500 volt megger to ground, with all other conductors in the cable and shield, grounded. The minimum acceptable megger resistance shall be 50 megohms for each conductor to ground.

DATE \_\_\_\_\_  
 PROJECT NAME \_\_\_\_\_ FEEDER NUMBER \_\_\_\_\_ LOCATION \_\_\_\_\_  
 FROM MANHOLE \_\_\_\_\_ TO MANHOLE \_\_\_\_\_  
 CABLE SIZE \_\_\_\_\_ CABLE LENGTH \_\_\_\_\_  
 NUMBER OF CONDUCTORS \_\_\_\_\_ INSULATION TYPE \_\_\_\_\_  
 MANUFACTURER \_\_\_\_\_ LINE VOLTAGE \_\_\_\_\_  
 TEMPERATURE \_\_\_\_\_ HUMIDITY \_\_\_\_\_  
 MEGGER TYPE \_\_\_\_\_ SERIAL NUMBER \_\_\_\_\_  
 TEST VOLTAGE \_\_\_\_\_ MULTIPLIER \_\_\_\_\_  
 REMARKS \_\_\_\_\_

CONDUCTOR NO.	MEGOHMS		CONTINUITY		CONDUCTOR NO.	MEGOHM		CONTINUITY	
	C/C	C/S	PAS	FAIL		C/C	C/S	PAS	FAIL

TEST PERFORMED BY: \_\_\_\_\_ Signature \_\_\_\_\_ Date \_\_\_\_\_

TEST WITNESSED BY: \_\_\_\_\_ Signature \_\_\_\_\_ Date \_\_\_\_\_

FORM 26 95 00-2

SINGLE & MULTIPLE CONDUCTOR POWER CABLE MEGGER TEST, 600V & LESS

WIRING - FEEDER CIRCUITS

Testing shall be performed before connecting the cable to the terminals at either end. Continuity of each conductor shall be checked at this time.

Each conductor shall be checked with a 500 volt megger to ground, with all other conductors in the cable and shield, grounded. The minimum acceptable megger resistance shall be 50 megohms for each conductor to ground.

DATE \_\_\_\_\_  
 PROJECT NAME \_\_\_\_\_ FEEDER NUMBER \_\_\_\_\_ LOCATION \_\_\_\_\_  
 FROM \_\_\_\_\_ TO \_\_\_\_\_  
 CABLE SIZE \_\_\_\_\_ CABLE LENGTH \_\_\_\_\_  
 NUMBER OF CONDUCTORS \_\_\_\_\_ INSULATION TYPE \_\_\_\_\_  
 MANUFACTURER \_\_\_\_\_ LINE VOLTAGE \_\_\_\_\_  
 TEMPERATURE \_\_\_\_\_ HUMIDITY \_\_\_\_\_  
 MEGGER TYPE \_\_\_\_\_ SERIAL NUMBER \_\_\_\_\_  
 TEST VOLTAGE \_\_\_\_\_ MULTIPLIER \_\_\_\_\_  
 REMARKS \_\_\_\_\_

If Applicable, All Shields Shall Be Properly Grounded prior to Testing.

Cable No.	MEGOHMS Phase A	MEGOHMS Phase B	MEGOHMS Phase C

TEST PERFORMED BY:

Signature

Date

TEST WITNESSED BY:

Signature

Date



3.04 WIRE AND CABLE TESTING (600 VOLTS)

- A. The 600 volt insulated wires and cables shall be factory tested prior to shipment in accordance with ICEA Standards for the insulation specified.
- B. The following 600 volt wires and cables shall be tested after installation but before final connections are made up:
  - 1. All feeders from 480 volt switchboards.
  - 2. All feeders from 480 volt motor control centers.
  - 3. All feeders to 480 volt panelboards.
  - 4. All feeders to 208/120 volt lighting panelboards.
- C. For the above listed wires and cables, a DC high potential test voltage, as specified in ICEA, shall be applied for a period, as specified in the Standard, between all conductors specified in the Standard, between all conductors in the same conduit and between each conductor to ground.

END OF SECTION 26 95 00

FAI 90/94/290(I-90/94/290)  
Project ACNHPP-0005(947)  
Section 2013-008R  
Cook County  
Contract 60W26

**APPENDIX D – STORM WATER POLLUTION PREVENTION PLAN**



## Storm Water Pollution Prevention Plan

Route F.A.I. 90/94/290  
Section 2013-008R  
County Cook County

Marked Harrison and Halsted Streets  
Project No. \_\_\_\_\_  
Contract No. 60W26

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.

John Fortmann, PE  
Print Name  
Director of Highways, Region One Engineer  
Title  
Illinois Department of Transportation  
Agency

\_\_\_\_\_  
Signature  
\_\_\_\_\_  
Date

### I. Site Description:

- A. Provide a description of the project location (include latitude and longitude):

Halsted Street over I-290 and the CTA Blue Line and Harrison Street Bridges over SB I-90/94 in the City of Chicago, Cook County, Illinois.

Latitude: 41° 52' 27.51" N  
Longitude: 87° 38' 49.56" W

- B. Provide a description of the construction activity which is the subject of this plan:

The project is located along Harrison Street from west of Halsted Street to east of SB 90/94 and along Halsted Street from south of Harrison Street to Van Buren Street. The gross and net length of the project is 1,674.04 Feet (0.319 miles).

The work consists of the reconstruction of the Harrison Street Bridge (SN 016-1713) over southbound

Interstate 90/94 from Halsted Street to east of SB 90/94, Halsted Street Bridge (SN 016-1716) over Interstate 290 and the CTA from south of Harrison Street to Van Buren Street and proposed retaining wall 13 (SN 016-1802) at the northeast quadrant of the intersection of Halsted Street and Harrison Street. Also included in the work is the intersection at Halsted Street and Harrison Street and widening of Ramp ES to replace the existing pavement section once the proposed pier is built within the existing ramp.

Work includes bridge reconstruction, retaining wall, roadway reconstruction, erosion control and protection, utility relocation of existing storm sewers and existing water main, special waste excavation, earth excavation and embankment, removal of existing improvements, new storm and combined sewers, curb and gutters, pavements, sidewalks, pavement marking and signage, roadway lighting, traffic control and protection, traffic signals, ITS, urban enhancements and all incidental and collateral work necessary to complete the improvements as shown on the plans and as described herein.

- C. Provide the estimated duration of this project:

12 months

- D. The total area of the construction site is estimated to be 4.36 acres.

The total area of the site estimated to be disturbed by excavation, grading or other activities is 2.00 acres.

- E. The following is a weighted average of the runoff coefficient for this project after construction activities are completed:

$$1.40 \text{ AC (0.3 PERVIOUS)} + 2.96 \text{ AC (0.9 IMPERVIOUS)} / 4.36 \text{ AC} = 0.71$$

The C-value will not change from before to after this contract, due to the existing impervious surfaces remaining before and after this project.

- F. List all soils found within project boundaries. Include map unit name, slope information, and erosivity:

Along Halsted Street, the soil stratigraphy consists generally of, in descending order, the general lithological succession encountered beneath the pavement structure includes (1) man-made ground (fill); (2) very soft to medium stiff clay; (3) stiff to hard silty clay; (4) dense to very dense silty loam and sandy gravel; and (5) strong, good rock quality dolostone.

Along Harrison Street, the soil stratigraphy consists generally of, in descending order, the general lithological succession encountered beneath the pavement and topsoil includes (1) man-made ground (fill); (2) very soft to medium stiff clay to silty clay; (3) stiff to hard silty clay and silty loam; (4) very dense gravelly sandy loam; and (5) strong, good quality dolostone bedrock.

- G. Provide an aerial extent of wetland acreage at the site:

No wetlands were identified on site

- H. Provide a description of potentially erosive areas associated with this project:

Potentially erosive areas are along the embankments adjacent to I-290 and SB I-90/94 expressways -

where there are no retaining walls from the local road to the expressway.

- 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):

Stage 1A will consist of the following:

- Tree removal and protection
- Install the appropriate erosion control and sediment control items as listed in the ESC plans
- Relocate and install 60" combined sewer and water main
- Remove existing Harrison Street Bridge approaches, superstructure, piers and abutments
- Begin reconstruction of the Harrison Street Bridge pier and abutments
- Install drainage along mainline and local road
- Remove east half of the existing Halsted Street Bridge superstructure with the exception of Pier 1 and approaches
- Construct all of the east half substructures except Pier 1
- Install drainage on east half of Halsted Street and along mainline
- Remove portions of the existing bridge abutment and foundation to allow for temporary drainage pipes to be installed
- Install temporary drainage under the Halsted Street Bridge along the ES ramp
- Provide pavement replacement at locations along Ramps ES and SW
- Remove existing island and install temporary pavement at the NW corner of the Halsted/Harrison intersection
- Install temporary pavement at locations specified in the plans
- Begin construction of the retaining wall

Stage 1B will consist of the following:

- Continue work on Harrison Street Bridge
- Install drainage at the Cermak Pumping Station
- Construct the substructure of Pier 1
- Erect the superstructure on the east half of the Halsted Street Bridge upon completion of Pier 1
- Construct deck and all other superstructure components except the east sidewalk and parapet
- Install portions of the proposed and temporary drainage systems on both the north and south side of the Halsted Street Bridge
- Continue construction of the retaining wall

Stage 2A will consist of the following:

- Remove and construct the gates, gate posts, and west driveway at the Cermak Pumping Station
- Construct the west driveway to the tie in with the east approach slab and abutment of Harrison Street Bridge
- Complete the reconstruction of the Harrison Street Bridge pier and abutments

- Begin reconstruction of the Harrison Street Bridge superstructure and approaches
- Install trench drain at the west driveway of the Cermak Pumping Station
- Remove and reconstruct the outside lanes of the west approach to the Halsted/Harrison Street intersection
- Remove the west half of the existing substructures, superstructures, and approaches of the Halsted Street Bridge
- Install temporary drainage systems on both the north and south side of the Halsted Street Bridge
- Install temporary bridge for pedestrian access to the Halsted Street CTA station
- Install temporary pavement along the ES ramp
- Reconstruct Pier 1 and south abutments
- Continue construction of the retaining wall

Stage 2B will consist of the following:

- Complete the reconstruction of the Harrison Street Bridge superstructure and approaches
- Remove temporary bridge for pedestrian access
- Complete the reconstruction of the west half of the Halsted Street bridge including all piers, abutments, superstructure and approaches
- Construct remaining portion of the proposed drainage system on the west side of Halsted Street Bridge
- Complete the construction of the retaining wall
- Re-grade the embankment between the back of concrete barrier and retaining wall

Stage 3 will consist of the following:

- Construct the east sidewalk and parapet along the east half of the Halsted Street Bridge
- Erect CTA canopy
- Remove existing erosion and sediment control measures
- Stabilize the final soil condition with the necessary permanent erosion and sediment control measures

- 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 / IDOT
- L. 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:

The Harrison and Halsted Street Bridges area drains to Pump Station 5, which then pumps to the South Branch Chicago River. The South Branch Chicago River is impaired for the designated use of fish consumption due to the PCBs. PCBs are not expected to be a pollutant associated with this contract. The South Branch Chicago River is not a Biologically Significant Stream.

- M. 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.

None. Embankment slopes to be regraded and vegetation to be re-established.

- N. 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):

- a. The name(s) of the listed water body, and identification of all pollutants causing impairment:
- 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:
- c. Provide a description of the location(s) of direct discharge from the project site to the 303(d) water body:
- d. Provide a description of the location(s) of any dewatering discharges to the MS4 and/or water body:

2. TMDL (fill out this section if checked above)

- a. The name(s) of the listed water body:
- b. Provide a description of the erosion and sediment control strategy that will be incorporated into the site design that is consistent with the assumptions and requirements of the TMDL:

c. If a specific numeric waste load allocation has been established that would apply to the project's discharges, provide a description of the necessary steps to meet that allocation:

O. 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 checked="" 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 checked="" type="checkbox"/> Other (specify) Drilling mud for jacking                       |
| <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 checked="" 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

- Stabilized 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(A)(1)(a) and II(A)(3), stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than seven (7) days 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.

Where the initiation of stabilization measures by the seventh day after construction activity temporarily or permanently ceases is precluded by snow cover, stabilization measures shall be initiated as soon as practicable thereafter.

The following stabilization practices will be used for this project:

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Preservation of Mature Vegetation | <input checked="" type="checkbox"/> Erosion Control Blanket / Mulching |
| <input type="checkbox"/> Vegetated Buffer Strips                      | <input checked="" type="checkbox"/> Sodding                            |
| <input checked="" type="checkbox"/> Protection of Trees               | <input type="checkbox"/> Geotextiles                                   |
| <input checked="" 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 checked="" type="checkbox"/> Temporary Mulching     | <input type="checkbox"/> Other (specify) |
| <input checked="" type="checkbox"/> Permanent Seeding      | <input type="checkbox"/> Other (specify) |

Describe how the stabilization practices listed above will be utilized during construction:

Refer to the Erosion and Sedimentation Control plan sheets for the contract for the specific stabilization practices called out for temporary and permanent conditions.

1. Preservation of Mature Vegetation: Mature vegetation shall be preserved as specified in the contract and at the direction of the Engineer.

2. Protection of Trees: Trees shall be protected as specified in the contract and at the direction of the Engineer.

3. Temporary Erosion Control Seeding: This item will be applied to all bare areas every seven days to minimize the amount of exposed surface areas. Earth stockpiles shall be temporarily seeded if they are to remain unused for more than 14 days. Within the construction limits, areas which may be susceptible to erosion as determined by the Engineer shall remain undisturbed until full scale construction is underway to prevent unnecessary soil erosion. Bare and sparsely vegetated ground in highly erodible areas as determined by the Engineer shall be temporarily seeded at the beginning of construction where no construction activities are expected within seven days.

4. Temporary Mulching: Mulch is applied to temporary erosion control seeding to allow for the seeding to take hold in the ground and grow. Without the mulching, the seeding will be displaced by wind and rain and therefore would not be able to grow. Mulch Method 4 (Compost) and surface roughing shall be used for temporary stabilization when temporary seed will not germinate. Mulch will be paid separately and shall conform to Section 251 of the Standard Specifications.

5. Permanent Seeding: Used at locations where there will be no more disturbances. The seeding will keep the soil from eroding due to natural conditions (wind, rain, etc.)

6. Erosion Control Blanket / Mulching: Erosion control blankets will be installed over fill slopes and in high velocity areas (i.e. ditches) and seeded to protect slopes from erosion and allow seeds to germinate. It will be installed over the permanent seeding to allow for the seeding to take hold in the ground and grow. Without the protection, the seeding will be displaced by wind and rain. Mulch will be applied in relatively flat areas to protect the disturbed areas and prevent further erosion.

7. Sodding: Sod is installed on slopes greater than 1V:2H or in areas of concentrated flows, sod shall be staked to prevent movement. Irrigate sod according to Article 252.08. Sod provides instant cover of soil for immediate erosion control. It also provides soil stabilization and acts as a filter for runoff.

Describe how the stabilization practices listed above will be utilized after construction activities have been completed:

Permanent Stabilization – All areas disturbed by construction will be stabilized with permanent seeding immediately following the finished grading. Erosion control blankets will be installed over slopes 3:1 (H:V) or steeper which have been brought to final grade, topsoiled, and have been seeded to protect the slopes from rill and gully erosion and allow seed to germinate properly. Mulch will be used on relatively flat areas.

Permanent Seeding: Seeding, Class 2A will be installed per IDOT specifications.

Sodding: This shall be applied as specified in the contract and at the direction of the Engineer.

Temporary or permanent stabilization shall be completed on the current stage prior to switching traffic to the next stage.

2. **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 checked="" type="checkbox"/> Perimeter Erosion Barrier     | <input type="checkbox"/> Rock Outlet Protection                          |
| <input type="checkbox"/> Temporary Ditch Check                    | <input type="checkbox"/> Riprap  |
| <input checked="" 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 checked="" type="checkbox"/> Retaining Walls                      |
| <input checked="" type="checkbox"/> Temporary Sediment Basin      | <input checked="" type="checkbox"/> Slope Walls                          |
| <input type="checkbox"/> Temporary Stream Crossing                | <input type="checkbox"/> Concrete Revetment Mats                         |
| <input checked="" type="checkbox"/> Stabilized Construction Exits | <input type="checkbox"/> Level Spreaders                                 |
| <input type="checkbox"/> Turf Reinforcement Mats                  | <input checked="" type="checkbox"/> Other (specify) Sump Pit             |
| <input type="checkbox"/> Permanent Check Dams                     | <input checked="" type="checkbox"/> Other (specify) Stabilized Flow Line |
| <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:

Refer to the Erosion and Sedimentation Control plan sheets for the contract for the specific stabilization practices called out for temporary and permanent conditions.

As soon as reasonable access is available to all locations where water drains away from the project, perimeter erosion barrier shall be installed as called out in this plan and directed by the

Engineer.

1. Perimeter Erosion Barrier: Silt fences shall be placed along the contour at the limits in an effort to contain silt and runoff from leaving the site. Silt fence shall not be installed in areas of concentrated flow such as across ditches. The barrier will be constructed at the beginning of construction. Damage to silt fence by traffic or snow plowing should be considered in making the direction to the Contractor.
2. Storm Drain Inlet Protection: Sediment filters will be placed in all open lid inlets, catch basins and manholes during construction and will be cleaned on a regular basis.
3. Temporary Sediment Basin/Sump Pit: A temporary sediment basin or sump pit will be used to temporarily collect runoff during construction. Water will be pumped out of the basin as needed. A filter bag will be required at the end of the discharge pipe.
4. Stabilized Construction Exits: Stabilized Construction Exits or Entrances will be provided by the Contractor. The entrance shall be maintained in a condition which shall prevent tracking or flowing of sediment onto Public-Right-Of-Way. Periodic Inspection and needed maintenance shall be provided after heavy use and each rainfall event.
5. Stabilized Flow Line: The Contractor shall provide to the RE a plan to have stabilized conveyance between upstream and downstream ends of storm sewer under construction when rain is forecasted, so that flow will not erode. This is important where new storm sewer connects to an existing storm sewer system. The use of a stabilized flow line between an installed storm sewer and open disturbance will reduce the potential for the offsite discharge of sediment-bearing waters.

All erosion control products furnished shall be specifically recommended by the manufacturer for the use specified in the erosion control plan prior to the approval and use of the product. The Contractor shall submit to the Engineer a notarized certification by the producer stating the intended use of the product and that the physical properties required for this application are met or exceeded. The contractor shall provide manufacturer installation procedures to facilitate the Engineer in construction inspection.

Describe how the structural practices listed above will be utilized after construction activities have been completed:

Once the construction is completed and the vegetation has been established, the perimeter barrier will be removed and areas disturbed by the removal will be stabilized with seeding and mulching.

3. **Storm Water Management:** Provided below is a description of measures that will be installed during the construction process to control 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.
  - a. 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.

- b. 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 storm water management controls:

Storage pipes will be constructed to hold storm water surcharging in the existing drainage to pump station 5.

A detention tank will be constructed that will improve water quality in runoff from the 5-year and greater storms, south of the Circle Interchange, discharging to pump station 26.

Also, Phosphorous fertilizer has been eliminated from the project to reduce project impacts on the receiving waters.

4. **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:

All management practices, controls, and other provisions provided in this plan are in accordance with "IDOT Standard Specification for Road and Bridge Construction" and "Illinois Urban Manual."

5. **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.
  - a. 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
- b. 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 applies to offsite Borrow and Waste/Use areas 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 – 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.
  - 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.

The Contractor will be responsible for the inspection, maintenance and repair of all sedimentation and erosion control measures. If the Engineer notices or is notified of an erosion or sedimentation deficiency, the Engineer will notify the Contractor to correct it. All Offsite Borrow, Waste, and Use areas are part of the construction site and are to be inspected according to the language in this section and Section IV.

Inspection of these areas shall be made at least once every seven days and within 24 hours of the end of each 0.5 inches or greater rainfall, or an equivalent snowfall. Additionally during winter months, all measures

should be checked after each significant snowmelt. Any necessary repairs or cleanup to maintain the effectiveness of said measures shall be made immediately. The project shall additionally be inspected by the Construction Field Engineer on a bi-weekly basis to determine that erosion control efforts are in place and effective and if other erosion control work is necessary.

All erosion and sediment control measures shall be maintained in accordance with the IDOT Erosion and Sediment Control Field Guide for Construction Inspection:

<http://www.dot.il.gov/desenv/environmental/idot%20field%20guide.pdf>

In additional, the following link may also be useful for maintenance:

<http://www.dot.il.gov/desenv/environmental/bestpractices.html>

Seeding - All erodible bare earth will be temporarily seeded on a weekly basis to minimize the amount of erodible surface within the contract limits. Construction equipment shall be stored and fueled only at designated locations. All necessary measures shall be taken to contain any fuel or pollution runoff in compliance with environmental law and EPA Water Quality Regulations. Leaking equipment or supplies shall be immediately repaired or removed from the site. On a weekly basis, the Engineer shall inspect the project to determine whether erosion control efforts are in place and effective and if additional control measures are necessary. Sediment collected during construction by the various temporary erosion control systems shall be disposed on the site on a regular basis as directed by the Engineer and stabilized accordingly.

Temporary Erosion Control Seeding – Reapply seed if stabilization has not been achieved. Apply temporary mulch to hold seed in place if seed has been washed away or found to be concentrated in ditch bottoms. Restore rills, greater than 4 inches deep, as quickly as possible on slopes steeper than 1V:4H to prevent sheet-flow from becoming concentrated flow patterns.

Perimeter Erosion Barrier - This shall be inspected every 7 calendar days and after a storm event of 0.5 inch or greater (including snowfall). Repair when tears, gaps, leaning or undermining occur and restore erosion barrier taut. Repair or replace any missing or broken stakes immediately. Sediment will be removed if the integrity of the fencing is in jeopardy. Remove once permanent stabilization is established since it will no longer be necessary.

Erosion Control Blanket - Repair damage due to water running beneath the blanket and restore when displacement occurs. Reseeding may be necessary. Replace and re-staple all displaced erosion control blankets immediately.

Mulching – Mulch shall be placed at the base of trees or shrubs; never in drainageways; and on temporary or final seeded areas away from traffic where it would be blown away.

Sodding – Limit foot traffic to low use for the first two to three weeks. Ensure irrigation rate does not result in runoff. Install salt-tolerant sod where needed. Replace when >25% of any individual piece of sod is no longer viable. Restore areas where rolling edges are present or sod is displaced.

Storm Drain Inlet Protection – Remove sediment from inlet filter basket when basket is 25% full or 50% of the fabric pores are covered with silt. Remove ponded water on road surfaces immediately. Clean filter if standing water is present longer than one hour after a rain event. Remove trash accumulated around or on top of practice. When filter is removed for cleaning, replace filter if any tear is present.

Protection of trees/temporary tree protection: Any protective measures which are knocked down shall be repaired immediately. Trim any cuts, skins, scrapes or bruises to the bark of the vegetation and utilize local nursery accepted procedures to seal damaged bark. Prune all tree branches broken, severed, or damaged during construction. Smoothly cut, perpendicular to the root, all cut, broken, or severed during construction, roots 1 inch or greater in diameter. Cover roots exposed during excavation with moist earth and/or backfill immediately to prevent roots from drying.

Temporary Sediment Basin – Remove accumulated silt when the basin becomes 50% filled. Maintain the outlet structure to prevent clogging. Correct erosion at outlet and provide stabilization if necessary.

Stabilized Construction Exits – Replenish stone or replace exit if vehicles continue to track sediment onto the roadway from the construction site. Sweep sediment on roadway from construction activities immediately. Use street sweeping in conjunction with this BMP to remove sediment not removed by the stabilized construction exit.

Material Delivery and Storage – Document the various types of materials delivered and their storage locations in the SWPPP. Update the SWPPP when significant changes occur to material storage or handling locations and when they have been removed. Cleanup spills immediately. Remove empty containers.

#### **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 that is 0.5 inch or greater or equivalent snowfall.

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

**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.5 of the Storm Water Pollution Prevention Plan (SWPPP) which will be handled by the Contractor/subcontractor completing this form.

Route	<u>F.A.I. 90/94/290</u>	Marked Rte.	<u>Harrison and Halsted Streets</u>
Section	<u>2013-008R</u>	Project No.	<u></u>
County	<u>Cook County</u>	Contract No.	<u>60W26</u>

This certification statement is a part of the 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 the SWPPP for the above mentioned project; I have received copies of all appropriate maintenance procedures; and, I have provided all documentation required to be in compliance with the Permit ILR10 and SWPPP and will provide timely updates to these documents as necessary.

- Contractor
- Sub-Contractor

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Name of Firm

\_\_\_\_\_

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Telephone

\_\_\_\_\_

FAI 90/94/290(I-90/94/290)  
Project ACNHPP-0005(947)  
Section 2013-008R  
Cook County  
Contract 60W26

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Street Address

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City/State/ZIP

Items which this Contractor/subcontractor will be responsible for as required in Section II.5. of the SWPPP:

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**DRAINAGE SYSTEM**

Effective : June 10, 1994

Revised: January 1, 2007

Description. This work shall consist of furnishing and installing a bridge drainage system as shown on the plans, including all piping, fittings, support brackets, inserts, bolts, and splash blocks when specified.

Material. The pipe and fittings shall be reinforced fiberglass according to ASTM D 2996 RTRP with a 30,000 psi (207 MPa) minimum short-time rupture strength hoop tensile stress. The reinforced fiberglass shall also have an apparent stiffness factor at 5 percent deflection exceeding 200 cu in.-lb/sq. in. (22.6 cu mm-kPa) and a minimum wall thickness of 0.10 in. (2.54 mm). All pipe supports and associated hardware shall be hot dip galvanized according to AASHTO M 232 (M 232M). The fiberglass pipe and fittings furnished shall be pigmented through out, or have a resin-rich pigmented exterior coat, specifically designed for overcoating fiberglass, as recommended by the manufacturer. The color shall be as specified by the Engineer. The resin in either case shall have an ultraviolet absorber designed to prevent ultraviolet degradation. The supplier shall certify the material supplied meets or exceeds these requirements.

Design. The drainage system shall be designed as an open system with allowances for the differential expansion and contraction expected between the superstructure and the substructure to which the drainage system is attached.

Installation. All connections of pipes and fittings shown on the plans to facilitate future removal for maintenance cleanout or flushing shall be made with a threaded, gasketed coupler or a bolted gasketed flange system. Adhesive bonded joints will be permitted for runs of pipe between such connections. The end run connection shall feature a minimum nominal 6 in. (150 mm) female threaded fiberglass outlet. Straight runs may utilize a 45 degree reducing saddle bonded to the pipe. The female outlet shall be filled with a male threaded PVC plug.

Runs of pipe shall be supported at spacings not exceeding those recommended by the manufacturer of the pipe. Supports that have point contact or narrow supporting areas shall be avoided. Standard slings, clamps, clevis hangers and shoe supports designed for use with steel pipe may be used. A minimum strap width for hangers shall be 1 1/2 in. (40 mm) for all pipe under 12 in. (300 mm) in diameter and 2 in. (50 mm) for diameters 12 in. (300 mm) or greater. Straps shall have 120 degrees of contact with the pipe. Pipes supported on less than 120 degrees of contact shall have a split fiberglass pipe protective sleeve bonded in place with adhesive.

All reinforced fiberglass pipe, fittings, and expansion joints shall be handled and installed according to guidelines and procedures recommended by the manufacturer or supplier of the material.

Basis of Payment. This work will be paid for at the contract lump sum price for DRAINAGE SYSTEM.

## **PIPE UNDERDRAINS FOR STRUCTURES**

Effective: May 17, 2000

Revised: January 22, 2010

Description. This work shall consist of furnishing and installing a pipe underdrain system as shown on the plans, as specified herein, and as directed by the Engineer.

Materials. Materials shall meet the requirements as set forth below:

The perforated pipe underdrain shall be according to Article 601.02 of the Standard Specifications. Outlet pipes or pipes connecting to a separate storm sewer system shall not be perforated.

The drainage aggregate shall be a combination of one or more of the following gradations, FA1, FA2, CA5, CA7, CA8, CA11, or CA13 thru 16, according to Sections 1003 and 1004 of the Standard Specifications.

The fabric surrounding the drainage aggregate shall be Geotechnical Fabric for French Drains according to Article 1080.05 of the Standard Specifications.

Construction Requirements. All work shall be according to the applicable requirements of Section 601 of the Standard Specifications except as modified below.

The pipe underdrains shall consist of a perforated pipe drain situated at the bottom of an area of drainage aggregate wrapped completely in geotechnical fabric and shall be installed to the lines and gradients as shown on the plans.

Method of Measurement. Pipe Underdrains for Structures shall be measured for payment in feet (meters), in place. Measurement shall be along the centerline of the pipe underdrains. All connectors, outlet pipes, elbows, and all other miscellaneous items shall be included in the measurement. Concrete headwalls shall be included in the cost of Pipe Underdrains for Structures, but shall not be included in the measurement for payment.

Basis of Payment. This work will be paid for at the contract unit price per foot (meter) for PIPE UNDERDRAINS FOR STRUCTURES of the diameter specified. Furnishing and installation of the drainage aggregate, geotechnical fabric, forming holes in structural elements and any excavation required, will not be paid for separately, but shall be included in the cost of the pipe underdrains for structures.

**STRUCTURAL REPAIR OF CONCRETE**

Effective: March 15, 2006

Revised: July 26, 2013

Description. This work shall consist of structurally repairing concrete.

Materials. Materials shall be according to the following.

Item	Article/Section
(a) Portland Cement Concrete (Note 1) .....	1020
(b) R1 or R2 Concrete (Note 2)	
(c) Normal Weight Concrete (Notes 3 and 4)	
(d) Shotcrete (High Performance) (Note 5)	
(e) Reinforcement Bars .....	1006.10
(f) Anchor Bolts .....	1006.09
(g) Water .....	1002
(h) Curing Compound (Type I) .....	1022.01
(i) Cotton Mats .....	1022.02
(j) Protective Coat .....	1023.01
(k) Epoxy (Note 6) .....	1025
(l) Mechanical Bar Splicers .....	508.06(c)

Note 1. The concrete shall be Class SI, except the cement factor shall be a minimum 6.65 cwt/cu yd (395 kg/cu m), the coarse aggregate shall be a CA 16, and the strength shall be a minimum 4000 psi (27,500 kPa) compressive or 675 psi (4650 kPa) flexural at 14 days. A high range water-reducing admixture shall be used to obtain a 5-7 in. (125-175 mm) slump, but a cement factor reduction according to Article 1020.05(b)(8) is prohibited. A self-consolidating concrete mixture is also acceptable per Article 1020.04, except the mix design requirements of this note regarding the cement factor, coarse aggregate, strength, and cement factor reduction shall apply.

Note 2. The R1 or R2 concrete shall be from the Department's approved list of Packaged, Dry, Rapid Hardening, Cementitious Materials for Concrete Repairs. The R1 or R2 concrete shall comply with the air content and strength requirements for Class SI concrete as indicated in Note 1. Mixing shall be per the manufacturer's recommendations, except the water/cement ratio shall not exceed the value specified for Class SI concrete as indicated in Note 1. A high range water-reducing admixture shall be used to obtain a 5-7 in. (125-175 mm) slump, and a retarder may be required to allow time to perform the required field tests. The admixtures shall be per the manufacturer's recommendation, and the Department's approved list of Concrete Admixtures shall not apply.

- Note 3. The “high slump” packaged concrete mixture shall be from the Department’s approved list of Packaged, Dry, Formed, Concrete Repair Mixtures. The materials and preparation of aggregate shall be according to ASTM C 387. The cement factor shall be 6.65 cwt/cu yd (395 kg/cu m) minimum to 7.05 cwt/cu yd (418 kg/cu m) maximum. Cement replacement with fly ash or ground granulated blast-furnace slag shall be according to Section 1020. The “high slump” packaged concrete mixture shall have a water soluble chloride ion content of less than 0.40 lb/cu yd (0.24 kg/cu m). The test shall be performed according to ASTM C 1218, and the “high slump” packaged concrete mixture shall have an age of 28 to 42 days at the time of test. The ASTM C 1218 test shall be performed by an independent lab a minimum of once every two years, and the test results shall be provided to the Department. The coarse aggregate shall be a maximum size of 1/2 in. (12.5 mm). The packaged concrete mixture shall comply with the air content and strength requirements for Class SI concrete as indicated in Note 1. Mixing shall be per the manufacturer’s recommendations, except the water/cement ratio shall not exceed the value specified for Class SI concrete as indicated in Note 1. A high range water-reducing admixture shall be used to obtain a 5-7 in. (125-175 mm) slump. The admixture shall be per the manufacturer’s recommendation, and the Department’s approved list of Concrete Admixtures shall not apply. A maximum slump of 10 in. (250 mm) may be permitted if no segregation is observed by the Engineer in a laboratory or field evaluation.
- Note 4 The “self-consolidating concrete” packaged concrete mixture shall be from the Department’s approved list of Packaged, Dry, Formed, Concrete Repair Mixtures. The materials and preparation of aggregate shall be according to ASTM C 387. The cement factor shall be 6.65 cwt/cu yd (395 kg/cu m) minimum to 7.05 cwt/cu yd (418 kg/cu m) maximum. Cement replacement with fly ash or ground granulated blast-furnace slag shall be according to Section 1020. The “self-consolidating concrete” packaged concrete mixture shall have a water soluble chloride ion content of less than 0.40 lb/cu yd (0.24 kg/cu m). The test shall be performed according to ASTM C 1218, and the “self-consolidating concrete” packaged concrete mixture shall have an age of 28 to 42 days at the time of test. The ASTM C 1218 test shall be performed by an independent lab a minimum of once every two years, and the test results shall be provided to the Department. The concrete mixture should be uniformly graded, and the coarse aggregate shall be a maximum size of 1/2 in. (12.5 mm). The fine aggregate proportion shall be a maximum 50 percent by weight (mass) of the total aggregate used. The packaged concrete mixture shall comply with the air content and strength requirements for Class SI concrete as indicated in Note 1. Mixing shall be per the manufacturer’s recommendations, except the water/cement ratio shall not exceed the value specified for Class SI concrete as indicated in Note 1. The admixtures used to produce self-consolidating concrete shall be per the manufacturer’s recommendation, and the Department’s approved list of Concrete Admixtures shall not apply. The packaged concrete mixture shall meet the following self-consolidating requirements:

- The slump flow range shall be 22 in. (560 mm) minimum to 28 in. (710 mm) maximum and tested according to Illinois Test Procedure SCC-2.
- The visual stability index shall be a maximum of 1 and tested according to Illinois Test Procedure SCC-2.
- The J-Ring value shall be a maximum of 2 in. (50 mm) and tested according to Illinois Test Procedure SCC-3. The L-Box blocking ratio shall be a minimum of 80 percent and tested according to Illinois Test Procedure SCC-4. The Manufacturer has the option to select either the J-Ring or L-Box test.
- The hardened visual stability index shall be a maximum of 1 and tested according to Illinois Test Procedure SCC-6.

Note 5. The packaged shotcrete mixture shall be from the Department's approved list of Packaged High Performance Shotcrete, and independent laboratory test results showing the product meets Department specifications will be required. The product shall be a packaged, pre-blended, and dry combination of materials, for the wet-mix shotcrete method according to ASTM C 1480. An accelerator is prohibited, except the shotcrete may be modified at the nozzle with a non-chloride accelerator for overhead applications. The shotcrete shall be Type FA or CA, Grade FR, and Class I. The fibers shall be Type III synthetic according to ASTM C 1116.

The packaged shotcrete shall have a water soluble chloride ion content of less than 0.40 lb/cu yd (0.24 kg/cu m). The test shall be performed according to ASTM C 1218, and the hardened shotcrete shall have an age of 28 to 42 days at the time of test. The ASTM C 1218 test shall be performed by an independent lab a minimum of once every two years, and the test results shall be provided to the Department.

Each individual aggregate used in the packaged shotcrete shall have either a maximum ASTM C 1260 expansion of 0.16 percent or a maximum ASTM C 1293 expansion of 0.040 percent. However, the ASTM C 1260 value may be increased to 0.27 percent for each individual aggregate if the cement total equivalent alkali content ( $\text{Na}_2\text{O} + 0.658\text{K}_2\text{O}$ ) does not exceed 0.60 percent. As an alternative to these requirements, ASTM C 1567 testing which shows the packaged shotcrete has a maximum expansion of 0.16 percent may be submitted. The ASTM C 1260, C 1293, or C 1567 test shall be performed a minimum of once every two years.

The 7 and 28 day compressive strength requirements in ASTM C 1480 shall not apply. Instead the shotcrete shall obtain a minimum compressive strength of 4000 psi (27,500 kPa) at 14 days.

The packaged shotcrete shall be limited to the following proportions:

The portland cement and finely divided minerals shall be 6.05 cwt/cu yd (360 kg/cu m) to 8.50 cwt/cu yd (505 kg/cu m) for Type FA and 6.05 cwt/cu yd (360 kg/cu. m) to 7.50 cwt/cu yd (445 kg/cu m) for Type CA. The portland cement shall not be below 4.70 cwt/cu yd (279 kg/cu m) for Type FA or CA.

The finely divided mineral(s) shall constitute a maximum of 35 percent of the total cement plus finely divided mineral(s).

Class F fly ash is optional and the maximum shall be 20 percent by weight (mass) of cement.

Class C fly ash is optional and the maximum shall be 25 percent by weight (mass) of cement.

Ground granulated blast-furnace slag is optional and the maximum shall be 30 percent by weight (mass) of cement.

Microsilica is required and shall be a minimum of 5 percent by weight (mass) of cement, and a maximum of 10 percent. As an alternative to microsilica, high-reactivity metakaolin may be used at a minimum of 5 percent by weight (mass) of cement, and a maximum of 10 percent.

Fly ash shall not be used in combination with ground granulated blast-furnace slag. Class F fly ash shall not be used in combination with Class C fly ash. Microsilica shall not be used in combination with high-reactivity metakaolin. A finely divided mineral shall not be used in combination with a blended hydraulic cement, except for microsilica or high-reactivity metakaolin.

The water/cement ratio as defined in Article 1020.06 shall be a maximum of 0.42.

The air content as shot shall be 4.0 – 8.0 percent.

Note 6. In addition ASTM C 881, Type IV, Grade 2 or 3, Class A, B, or C may be used.

Equipment. Equipment shall be according to Article 503.03 and the following.

Chipping Hammer – The chipping hammer for removing concrete shall be a light-duty pneumatic or electric tool with a 15 lb. (7 kg) maximum class or less.

Blast Cleaning Equipment – Blast cleaning equipment for concrete surface preparation shall be the abrasive type, and the equipment shall have oil traps.



Hydrodemolition Equipment – Hydrodemolition equipment for removing concrete shall be calibrated, and shall use water according to Section 1002.

High Performance Shotcrete Equipment – The batching, mixing, pumping, hose, nozzle, and auxiliary equipment shall be for the wet-mix shotcrete method, and shall meet the requirements of ACI 506R.

### Construction Requirements

General. The repair methods shall be either formed concrete repair or shotcrete. The repair method shall be selected by the Contractor with the following rules.

- (a) Rule 1. For formed concrete repair, a subsequent patch to repair the placement point after initial concrete placement will not be allowed. As an example, this may occur in a vertical location located at the top of the repair.
- (b) Rule 2. Formed concrete repair shall not be used for overhead applications.
- (c) Rule 3. Shotcrete shall not be used for column repairs greater than 4 in. (100 mm) in depth, or any repair location greater than 8 in. (205 mm) in depth. The only exception to this rule would be for a horizontal application, where the shotcrete may be placed from above in one lift.
- (d) Rule 4. If formed concrete repair is used for locations that have reinforcement with less than 0.75 in. (19 mm) of concrete cover, the concrete mixture shall contain fly ash or ground granulated blast-furnace slag at the maximum cement replacement allowed.

Temporary Shoring or Cribbing. When a temporary shoring or cribbing support system is required, the Contractor shall provide details and computations, prepared and sealed by an Illinois licensed Structural Engineer, to the Department for review and approval. When ever possible the support system shall be installed prior to starting the associated concrete removal. If no system is specified, but during the course of removal the need for temporary shoring or cribbing becomes apparent or is directed by the Engineer due to a structural concern, the Contractor shall not proceed with any further removal work until an appropriate and approved support system is installed.

Concrete Removal. The Contractor shall provide ladders or other appropriate equipment for the Engineer to mark the removal areas. Repair configurations will be kept simple, and squared corners will be preferred. The repair perimeter shall be sawed a depth of 1/2 in. (13 mm) or less, as required to avoid cutting the reinforcement. Any cut reinforcement shall be repaired or replaced at the expense of the Contractor. If the concrete is broken or removed beyond the limits of the initial saw cut, the new repair perimeter shall be recut. The areas to be repaired shall have all loose, unsound concrete removed completely by the use of chipping hammers, hydrodemolition equipment, or other methods approved by the Engineer. The concrete removal shall extend along the reinforcement bar until the reinforcement is free of bond inhibiting corrosion. The outermost layer of reinforcement bar within the repair area shall be undercut to a depth of 3/4 in. (19 mm) or the diameter of the reinforcement bar, whichever value is larger. The underlying transverse reinforcement bar shall also be undercut as previously described, unless the reinforcement is not corroded, and the reinforcement bar is encased and well bonded to the surrounding concrete.

If sound concrete is encountered before existing reinforcement bars are exposed, further removal of concrete shall not be performed unless the minimum repair depth is not met.

The repair depth shall be a minimum of 1 in. (25 mm). The substrate profile shall be  $\pm 1/16$  in. ( $\pm 1.5$  mm). The perimeter of the repair area shall have a vertical face.

If a repair is located at the ground line, any excavation required below the ground line to complete the repair shall be included in this work.

The Contractor shall have a maximum of 14 calendar days to complete each repair location with concrete or shotcrete, once concrete removal has started for the repair.

The Engineer shall be notified of concrete removal that exceeds 6 in. (150 mm) in depth, one fourth the cross section of a structural member, more than half the vertical column reinforcement is exposed in a cross section, more than 6 consecutive reinforcement bars are exposed in any direction, within 1.5 in. (38 mm) of a bearing area, or other structural concern. Excessive deterioration or removal may require further evaluation of the structure or installation of temporary shoring and cribbing support system.

Surface Preparation. Prior to placing the concrete or shotcrete, the Contractor shall prepare the repair area and exposed reinforcement by blast cleaning. The blast cleaning shall provide a surface that is free of oil, dirt, and loose material.

If a succeeding layer of shotcrete is to be applied, the initial shotcrete surface and remaining exposed reinforcement shall be free of curing compound, oil, dirt, loose material, rebound (i.e. shotcrete material leaner than the original mixture which ricochets off the receiving surface), and overspray. Preparation may be by lightly brushing or blast cleaning if the previous shotcrete surface is less than 36 hours old. If more than 36 hours old, the surface shall be prepared by blast cleaning.

The repair area and perimeter vertical face shall have a rough surface. Care shall be taken to ensure the perimeter sawcut is roughened. Just prior to concrete or shotcrete placement, saturate the repair area with water to a saturated surface-dry condition. Any standing water shall be removed.

Concrete or shotcrete placement shall be done within 3 calendar days of the surface preparation or the repair area shall be prepared again.

Reinforcement. Exposed reinforcement bars shall be cleaned of concrete and corrosion by blast cleaning. After cleaning, all exposed reinforcement shall be carefully evaluated to determine if replacement or additional reinforcement bars are required.

Reinforcing bars that have been cut or have lost 25 percent or more of their original cross sectional area shall be supplemented by new in kind reinforcement bars. New bars shall be lapped a minimum of 32 bar diameters to existing bars. A mechanical bar splicer shall be used when it is not feasible to provide the minimum bar lap. No welding of bars shall be performed.

Intersecting reinforcement bars shall be tightly secured to each other using 0.006 in. (1.6 mm) or heavier gauge tie wire, and shall be adequately supported to minimize movement during concrete placement or application of shotcrete.

For reinforcement bar locations with less than 0.75 in. (19 mm) of cover, protective coat shall be applied to the completed repair. The application of the protective coat shall be according to Article 503.19, 2nd paragraph, except blast cleaning shall be performed to remove curing compound.

The Contractor shall anchor the new concrete to the existing concrete with 3/4 in. (19 mm) diameter hook bolts for all repair areas where the depth of concrete removal is greater than 8 in. (205 mm) and there is no existing reinforcement extending into the repair area. The hook bolts shall be spaced at 15 in. (380 mm) maximum centers both vertically and horizontally, and shall be a minimum of 12 in. (305 mm) away from the perimeter of the repair. The hook bolts shall be installed according to Section 584.

Repair Methods. All repair areas shall be inspected and approved by the Engineer prior to placement of the concrete or application of the shotcrete.

- (a) Formed Concrete Repair. Falsework shall be according to Article 503.05. Forms shall be according to Article 503.06. Formwork shall provide a smooth and uniform concrete finish, and shall approximately match the existing concrete structure. Formwork shall be mortar tight and closely fitted where they adjoin the existing concrete surface to prevent leakage. Air vents may be provided to reduce voids and improve surface appearance. The Contractor may use exterior mechanical vibration, as approved by the Engineer, to release air pockets that may be entrapped.

The concrete for formed concrete repair shall be a Class SI Concrete, or a packaged R1 or R2 Concrete with coarse aggregate added, or a packaged Normal Weight Concrete at the Contractor's option. The concrete shall be placed and consolidated according to Article 503.07. The concrete shall not be placed when frost is present on the surface of the repair area, or the surface temperature of the repair area is less than 40 °F (4 °C). All repaired members shall be restored as close as practicable to their original dimensions.

Curing shall be done according to Article 1020.13.

If temperatures below 45°F (7°C) are forecast during the curing period, protection methods shall be used. Protection Method I according to Article 1020.13(d)(1), or Protection Method II according to Article 1020.13(d)(2) shall be used during the curing period.

The surfaces of the completed repair shall be finished according to Article 503.15.

- (b) Shotcrete. Shotcrete shall be tested by the Engineer for air content according to Illinois Modified AASHTO T 152. Obtain the sample in a damp, non-absorbent container from the discharge end of the nozzle.

For compressive strength of shotcrete, a 18 x 18 x 3.5 in. (457 x 457 x 89 mm) test panel shall be shot by the Contractor for testing by the Engineer. A steel form test panel shall have a minimum thickness of 3/16 in. (5 mm) for the bottom and sides. A wood form test panel shall have a minimum 3/4 in. (19 mm) thick bottom, and a minimum 1.5 in. (38 mm) thickness for the sides. The test panel shall be cured according to Article 1020.13 (a) (3) or (5) while stored at the jobsite and during delivery to the laboratory. After delivery to the laboratory for testing, curing and testing shall be according to ASTM C 1140.

The method of alignment control (i.e. ground wires, guide strips, depth gages, depth probes, and formwork) to ensure the specified shotcrete thickness and reinforcing bar cover is obtained shall be according to ACI 506R. Ground wires shall be removed after completion of cutting operations. Guide strips and formwork shall be of dimensions and a configuration that do not prevent proper application of shotcrete. Metal depth gauges shall be cut 1/4 in. (6 mm) below the finished surface. All repaired members shall be restored as close as practicable to their original dimensions.

For air temperature limits when applying shotcrete in cold weather, the first paragraph of Article 1020.14(b) shall apply. For hot weather, shotcrete shall not be applied when the air temperature is greater than 90°F (32°C). The applied shotcrete shall have a minimum temperature of 50°F (10°C) and a maximum temperature of 90°F (32°C). The shotcrete shall not be applied during periods of rain unless protective covers or enclosures are installed. The shotcrete shall not be applied when frost is present on the surface of the repair area, or the surface temperature of the repair area is less than 40°F (4°C). If necessary, lighting shall be provided to provide a clear view of the shooting area.

The shotcrete shall be applied according to ACI 506R, and shall be done in a manner that does not result in cold joints, laminations, sandy areas, voids, sags, or separations. In addition, the shotcrete shall be applied in a manner that results in maximum densification of the shotcrete. Shotcrete which is identified as being unacceptable while still plastic shall be removed and re-applied.

The nozzle shall normally be at a distance of 2 to 5 ft. (0.6 to 1.5 m) from the receiving surface, and shall be oriented at right angles to the receiving surface. Exceptions to this requirement will be permitted to fill corners, encase large diameter reinforcing bars, or as approved by the Engineer. For any exception, the nozzle shall never be oriented more than 45 degrees from the surface. Care shall be taken to keep the front face of the reinforcement bar clean during shooting operations. Shotcrete shall be built up from behind the reinforcement bar. Accumulations of rebound and overspray shall be continuously removed prior to application of new shotcrete. Rebound material shall not be incorporated in the work.

Whenever possible, shotcrete shall be applied to the full thickness in a single layer. The maximum thickness shall be 4 in. (100 mm) unless the shotcrete is applied from above on a horizontal surface, or a thicker application is approved by the Engineer. When two or more layers are required, the minimum number shall be used and shall be done in a manner without sagging or separation. A flash coat (i.e. a thin layer of up to 1/4 in. (6 mm) applied shotcrete) may be used as the final lift for overhead applications.

Prior to application of a succeeding layer of shotcrete, the initial layer of shotcrete shall be prepared according to the surface preparation and reinforcement bar cleaning requirements. Upon completion of the surface preparation and reinforcement bar treatment, water shall be applied according to the surface preparation requirements unless the surface is moist. The second layer of shotcrete shall then be applied within 30 minutes.

Shotcrete shall be cut back to line and grade using trowels, cutting rods, screeds or other suitable devices. The shotcrete shall be allowed to stiffen sufficiently before cutting. Cutting shall not cause cracks or delaminations in the shotcrete. For depressions, cut material may be used for small areas. Rebound material shall not be incorporated in the work. For the final finish, a wood float shall be used to approximately match the existing concrete texture. All repaired members shall be restored as close as practicable to their original dimensions.

Contractor operations for curing shall be continuous with shotcrete placement and finishing operations. The Engineer may require modification of operations to ensure satisfactory results are obtained. Cotton mats shall be applied according to Article 1020.13(a)(5) except the exposed layer of shotcrete shall be covered within 10 minutes after finishing, and wet curing shall begin immediately. As an alternative to this method, Type I curing compound shall be applied according to Article 1020.13(a)(4) and moist curing with cotton mats shall begin within 3 hours. For overhead applications where the final shotcrete layer has been applied, the Contractor has the option to use Type I curing compound in lieu of the cotton mats. Note 5 of the Index Table in Article 1020.13 shall apply to the membrane curing method. The curing compound shall be applied according to Article 1020.13(a)(4).

When a shotcrete layer is to be covered by a succeeding shotcrete layer within 36 hours, the repair area shall be protected with intermittent hand fogging, or wet curing with either burlap or cotton mats shall begin within 10 minutes. Intermittent hand fogging may be used only for the first hour. Thereafter, wet curing with burlap or cotton mats shall be used until the succeeding shotcrete layer is applied. Intermittent hand fogging may be extended to the first hour and a half if the succeeding shotcrete layer is applied by the end of this time.

The curing period shall be for 7 days, except when there is a succeeding layer of shotcrete. In this instance, the initial shotcrete layer shall be cured until the surface preparation and reinforcement bar treatment is started.

If temperatures below 45°F (7°C) are forecast during the curing period, protection methods shall be used. Protection Method I according to Article 1020.13(d)(1), or Protection Method II according to Article 1020.13(d)(2) shall be used during the curing period

Inspection of Completed Work. The Contractor shall provide ladders or other appropriate equipment for the Engineer to inspect the repaired areas. After curing but no sooner than 28 days after placement of concrete or shooting of shotcrete, the repair shall be examined for conformance with original dimensions, cracks, voids, and delaminations. Sounding for delaminations will be done with a hammer or by other methods determined by the Engineer.

The repaired area shall be removed and replaced, as determined by the Engineer, for nonconformance with original dimensions, surface cracks greater than 0.01 in. (0.25 mm) in width, map cracking with a crack spacing in any direction of 18 in. (0.45 m) or less, voids, or delaminations.

If a nonconforming repair is allowed to remain in place, cracks 0.01 in. (0.25 mm) or less shall be repaired with epoxy according to Section 590. For cracks less than 0.007 in. (2 mm), the epoxy may be applied to the surface of the crack. Voids shall be repaired according to Article 503.15.

Publications and Personnel Requirements. The Contractor shall provide a current copy of ACI 506R to the Engineer a minimum of one week prior to start of construction.

The shotcrete personnel who perform the work shall have current American Concrete Institute (ACI) nozzle men certification for vertical wet and overhead wet applications, except one individual may be in training. This individual shall be adequately supervised by a certified ACI nozzle men as determined by the Engineer. A copy of the nozzle men certificate(s) shall be given to the Engineer.

Method of Measurement. This work will be measured for payment in place and the area computed in square feet (square meters). For a repair at a corner, both sides will be measured.

Basis of Payment. This work will be paid for at the contract unit price per square foot (square meter) for STRUCTURAL REPAIR OF CONCRETE (DEPTH GREATER THAN 5 IN. (125 MM)), STRUCTURAL REPAIR OF CONCRETE (DEPTH EQUAL TO OR LESS THAN 5 IN. (125 MM)).

When not specified to be paid for elsewhere, the work to design, install, and remove the temporary shoring and cribbing will be paid for according to Article 109.04.

With the exception of reinforcement damaged by the Contractor during removal, the furnishing and installation of supplemental reinforcement bars, mechanical bar splicers, hook bolts, and protective coat will be paid according to Article 109.04.

**GRANULAR BACKFILL FOR STRUCTURES**

Effective: April 19, 2012  
Revised: October 30, 2012

Revise Section 586 of the Standard Specifications to read:

**SECTION 586. Granular Backfill for structures**

**586.01 Description.** This work shall consist of furnishing, transporting and placing granular backfill for abutment structures.

**586.02 Materials.** Materials shall be according to the following.

Item	Article/Section
(a) Fine Aggregate.....	1003.04
(b) Coarse Aggregates .....	1004.05

**CONSTRUCTION REQUIREMENTS**

**586.03 General.** This work shall be done according to Article 502.10 except as modified below. The backfill volume shall be backfilled, with granular material as specified in Article 586.02, to the required elevation as shown in the contract plans. The backfill volume shall be placed in convenient lifts for the full width to be backfilled. Unless otherwise specified in the contract plans, mechanical compaction will not be required. A deposit of gravel or crushed stone placed behind drain holes shall not be required. All drains not covered by geocomposite wall drains or other devices to prevent loss of backfill material shall be covered by sufficient filter fabric material meeting the requirements of Section 1080 and Section 282 with either 6 or 8 oz/sq yd (200 or 270 g/sq m) material allowed, with free edges overlapping the drain hole by at least 12 in. (300 mm) in all directions.

The granular backfill shall be brought to the finished grade as shown in the contract plans. When concrete is to be cast on top of the granular backfill, the Contractor, subject to approval of the Engineer, may prepare the top surface of the fill to receive the concrete as he/she deems necessary for satisfactory placement at no additional cost to the Department.

**586.04 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. This work will be measured for payment in place and the volume computed in cubic yards (cubic meters). The volume will be determined by the method of average end areas behind the abutment.

**586.05 Basis of Payment.** This work will be paid for at the contract unit price per cubic yard (cubic meter) for GRANULAR BACKFILL FOR STRUCTURES.



**WEEP HOLE DRAINS FOR ABUTMENTS, WINGWALLS, RETAINING WALLS AND CULVERTS**

Effective: April 19, 2012

Delete the last paragraphs of 205.05 and 502.10 and replace with the following.

If a geocomposite wall drain according to Section 591 is not specified, a prefabricated geocomposite strip drain according to Section 1040.07 shall be placed at the back of each drain hole. The strip drain shall be 24 inches (600 mm) wide and 48 inches (1.220 m) tall. The strip drain shall be centered over the drain hole with the bottom located 12 inches (300 mm) below the bottom of the drain hole. All form boards or other obstructions shall be removed from the drain holes before placing any geocomposite strip drain.

Revise the title of 1040.07 to Geocomposite Wall Drains and Strip Drains.

**ABOVE GRADE INLET PROTECTION (BDE)**

Effective: July 1, 2009

Revised: January 1, 2012

Add the following to Article 280.02 of the Standard Specifications:

“(m) Above Grade Inlet Filter .....1081.15(j)”

Add the following paragraph after the second paragraph of Article 280.04(c) of the Standard Specifications:

“When above grade inlet filters are specified, they shall be of sufficient size to completely span and enclose the inlet structure. Prior to ordering materials, the Contractor shall determine the size of the various drainage structures being protected.”

Add the following paragraph after the second paragraph of Article 280.08(d) of the Standard Specifications:

“Protection of drainage structures with rigid inlet protection assemblies will be paid for at the contract unit price per each for ABOVE GRADE INLET FILTERS.”

Add the following to Article 1081.15 of the Standard Specifications:

“(j) Above Grade Inlet Filters. Above grade inlet filters shall consist of a rigid polyethylene frame covered with a fitted geotextile filter. A clean, used fitted filter and a used rigid polyethylene frame in good condition meeting the approval of the Engineer may be substituted for new materials. Materials for the above grade inlet filter assembly shall be according to the following.

- (1) Frame Construction. Frame shall be constructed of a high density polyethylene copolymer. The design of the frame shall allow the structure to fit completely over the sewer inlet. The frame shall be a minimum of 26 in. (650 mm) tall and the top of the frame shall be designed with an opening to allow large volumes of water to pass through under high flow events. The frame shall conform to the following requirements:

Frame		
Material Property	Test Method	Value
Tensile Yield Strength	ASTM D 638	3600 psi (24.82 MPa)
Elongation at Break	ASTM D 638	>600%
Tensile-Impact Strength	ASTM D 1822	170 ft lb/sq in (230 J)
Brittleness Temperature	ASTM D 746	<-105°F (-76.11°C)
Environmental Stress Cracking	ASTM D 1693	>800 hours
Durometer Hardness, Shore A	ASTM D 2240	68

Vicat Softening Temperature	ASTM D 1525	254°F (123.33°C)
Deflection Temperature	ASTM D 648	157°F (69.44°C)
Coefficient of Linear Thermal Expansion	ASTM D 696	$7 \times 10^{-5}$ in/in/°F ( $12.6 \times 10^{-5}$ m/m/°C)
Bulk Density	ASTM D 1895	37 lbs/cu ft (592.7 kg/cu m)

- (2) Fitted Geotextile Filter. The sides of the fitted geotextile filter shall be constructed of 100 percent continuous polyester needle-punched fabric. The filter shall be fabricated to provide a direct fit to the frame. The top of the filter shall integrate a coarse screening to allow large volumes of water to pass through in the event of heavy flows. This screening shall have a minimum apparent opening of 1/2 in. (13 mm). The filter shall have integrated anti-buoyancy pockets capable of holding no less than 3.0 cu ft (0.08 cu m) of stabilization material. Each filter shall have a label with the following information sewn to or otherwise permanently adhered to the outside: manufacturer's name, product name, and lot, model or serial number. The fitted geotextile filter shall conform to the following requirements:

Fitted Geotextile Filter		
Material Property	Test Method	Minimum Avg. Roll Value
Weight	ASTM D 3776	3.0 oz/sq yd +/- 10% (71.1 grams/sq m)
Grab Tensile Strength	ASTM D 4632	80 lb min. (36.29 kg)
Grab Tensile Elongation	ASTM D 4632	50%
Bursting Strength	ASTM D 3786	150 psi min. (1.03 MPa)
Puncture Resistance	ASTM D 4833	50 lb min. (22.68 kg)
Trapezoid Tearing Strength	ASTM D 4533	30 lb min. (13.61 kg)
Apparent Opening Size	ASTM D 4751	Sieve No. 70 (0.212 mm)
Permittivity	ASTM D 4491	2.0/sec
Water Permeability	ASTM D 4491	102 gal/min/sq ft (4150 liter/min/sq m)
UV Resistance	ASTM D 4355	70% at 500 hours

- (3) Certification. The manufacturer shall furnish a certificate with each shipment of above grade inlet filter assemblies, stating the amount of product furnished and that the material complies with these requirements.”

**ANCHOR BOLTS (BDE)**

Effective: January 1, 2013

Revise the fourth sentence of the first paragraph of Article 1006.09 of the Standard Specifications to read:

“Stud bolts or fully threaded rods shall be according to either ASTM A 354 Grade BC, ASTM A 193 Grade B7, or ASTM F 1554 Grade 105.”

Revise the second paragraph of Article 1006.09 of the Standard Specifications to read:

“Washers and nuts shall match with the hardness of the anchor bolt, stud, or rod. For ASTM F 1554 Grade 36 (Grade 250) or Grade 55 (Grade 380) anchor rods or bolts, washers shall be according to ASTM F 844 or ASTM F 436, and nuts shall be according to AASHTO M 291 Grade A. For ASTM F 1554 Grade 105 (Grade 725) bolts, ASTM A 354, or ASTM A 193 stud bolts, washers shall be according to AASHTO M 293 Type 1 or Type 3, and nuts shall be according to AASHTO M 291 Grade DH or DH3.”

Revise the seventh paragraph of Article 1006.09 of the Standard Specifications to read:

“Anchor bolts, rods, studs, nuts, and washers requiring galvanizing shall be hot dipped, with zinc coatings conforming to the requirements of ASTM F 2329.”

Revise the fourth paragraph of Article 1070.01 of the Standard Specifications to read:

“Fully threaded and galvanized anchor rods or stud bolts with washers and nuts shall be furnished with the foundations and shall be according to Article 1006.09. Anchors furnished according to ASTM F 1554 shall be Grade 105 (Grade 725).”

Revise the second paragraph of Article 1070.03 of the Standard Specifications to read:

“Top anchor rod nuts for all towers shall be the self-locking type with nylon or steel inserts.”

#### **COARSE AGGREGATE IN BRIDGE APPROACH SLABS/FOOTINGS (BDE)**

Effective: April 1, 2012

Revised: April 1, 2013

Revise the third paragraph of Article 1004.01(b) of the Standard Specifications to read:

“Aggregates used in Class BS concrete (except when poured on subgrade), Class PS concrete, and Class PC concrete (bridge superstructure products only, excluding the approach slab) shall contain no more than two percent by weight (mass) of deleterious materials. Deleterious materials shall include substances whose disintegration is accompanied by an increase in volume which may cause spalling of the concrete.”

Revise the first sentence of the first paragraph of Article 1004.02(f) of the Standard Specifications to read:

“(f) Freeze-Thaw Rating. When coarse aggregate is used to produce portland cement concrete for base course, base course widening, pavement (including precast), driveway pavement, sidewalk, shoulders, curb, gutter, combination curb and gutter, median, paved ditch, concrete superstructures on subgrade such as bridge approach slabs (excluding precast), concrete structures on subgrade such as bridge approach footings, or their repair using concrete, the gradation permitted will be determined from the results of the Department’s Freeze-Thaw Test (Illinois Modified AASHTO T 161).”

**CONSTRUCTION AIR QUALITY – DIESEL RETROFIT (BDE)**

Effective: June 1, 2010

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/otaq/retrofit/verif-list.htm>), or verified by the California Air Resources Board (CARB) (<http://www.arb.ca.gov/diesel/verde/verdev.htm>); or
- b) Retrofitted with a non-verified diesel retrofit emission control device if verified retrofit emission control devices are not available for equipment proposed to be used on the project, and if the Contractor has obtained a performance certification from the retrofit device manufacturer that the emission control device provides a minimum PM emission reduction of 50 percent.

Note: Large cranes (Crawler mounted cranes) which are responsible for critical lift operations are exempt from installing retrofit emission control devices if such devices adversely affect equipment operation.

Diesel powered off-road equipment with engine ratings of 50 hp and above, which are unable to be retrofitted with verified emission control devices or if performance certifications are not available which will achieve a minimum 50 percent PM reduction, may be granted a waiver by the Department if documentation is provided showing good faith efforts were made by the Contractor to retrofit the equipment.

Construction shall not proceed until the Contractor submits a certified list of the diesel powered off-road equipment that will be used, and as necessary, retrofitted with emission control devices. The list(s) shall include (1) the equipment number, type, make, Contractor/rental company name; and (2) the emission control devices make, model, USEPA or CARB verification number, or performance certification from the retrofit device manufacturer. Equipment reported as fitted with emissions control devices shall be made available to the Engineer for visual inspection of the device installation, prior to being used on the jobsite.

The Contractor shall submit an updated list of retrofitted off-road construction equipment as retrofitted equipment changes or comes on to the jobsite. The addition or deletion of any diesel powered equipment shall be included on the updated list.

If any diesel powered off-road equipment is found to be in non-compliance with any portion of this special provision, the Engineer will issue the Contractor a diesel retrofit deficiency deduction.

Any costs associated with retrofitting any diesel powered off-road equipment with emission control devices shall be considered as included in the contract unit prices bid for the various items of work involved and no additional compensation will be allowed. The Contractor's compliance with this notice and any associated regulations shall not be grounds for a claim.

### **Diesel Retrofit Deficiency Deduction**

When the Engineer determines that a diesel retrofit deficiency exists, a daily monetary deduction will be imposed for each calendar day or fraction thereof the deficiency continues to exist. The calendar day(s) will begin when the time period for correction is exceeded and end with the Engineer's written acceptance of the correction. The daily monetary deduction will be \$1,000.00 for each deficiency identified.

The deficiency will be based on lack of diesel retrofit emissions control.

If a Contractor accumulates three diesel retrofit deficiency deductions for the same piece of equipment in a contract period, the Contractor will be shutdown until the deficiency is corrected. Such a shutdown will not be grounds for any extension of the contract time, waiver of penalties, or be grounds for any claim.

## **DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION (BDE)**

Effective: September 1, 2000

Revised: August 2, 2011

FEDERAL OBLIGATION. The Department of Transportation, as a recipient of federal financial assistance, is required to take all necessary and reasonable steps to ensure nondiscrimination in the award and administration of contracts. Consequently, the federal regulatory provisions of 49 CFR Part 26 apply to this contract concerning the utilization of disadvantaged business enterprises. For the purposes of this Special Provision, a disadvantaged business enterprise (DBE) means a business certified by the Department in accordance with the requirements of 49 CFR Part 26 and listed in the Illinois Unified Certification Program (IL UCP) DBE Directory.

STATE OBLIGATION. This Special Provision will also be used by the Department to satisfy the requirements of the Business Enterprise for Minorities, Females, and Persons with Disabilities Act, 30 ILCS 575. When this Special Provision is used to satisfy state law requirements on 100 percent state-funded contracts, the federal government has no involvement in such contracts (not a federal-aid contract) and no responsibility to oversee the implementation of this Special Provision by the Department on those contracts. DBE participation on 100 percent state-funded contracts will not be credited toward fulfilling the Department's annual overall DBE goal required by the US Department of Transportation to comply with the federal DBE program requirements.

CONTRACTOR ASSURANCE. The Contractor makes the following assurance and agrees to include the assurance in each subcontract that the Contractor signs with a subcontractor.

The Contractor, subrecipient, or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of contracts funded in whole or in part with federal or state funds. Failure by the Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate.

OVERALL GOAL SET FOR THE DEPARTMENT. As a requirement of compliance with 49 CFR Part 26, the Department has set an overall goal for DBE participation in its federally assisted contracts. That goal applies to all federal-aid funds the Department will expend in its federally assisted contracts for the subject reporting fiscal year. The Department is required to make a good faith effort to achieve the overall goal. The dollar amount paid to all approved DBE companies performing work called for in this contract is eligible to be credited toward fulfillment of the Department's overall goal.

CONTRACT GOAL TO BE ACHIEVED BY THE CONTRACTOR. This contract includes a specific DBE utilization goal established by the Department. The goal has been included because the Department has determined that the work of this contract has subcontracting opportunities that may be suitable for performance by DBE companies. The determination is based on an assessment of the type of work, the location of the work, and the availability of DBE companies to do a part of the work. The assessment indicates that, in the absence of unlawful discrimination, and in an arena of fair and open competition, DBE companies can be expected to perform **23.00%** of the work. This percentage is set as the DBE participation goal for this contract. Consequently, in addition to the other award criteria established for this contract, the Department will only award this contract to a bidder who makes a good faith effort to meet this goal of DBE participation in the performance of the work. A bidder makes a good faith effort for award consideration if either of the following is done in accordance with the procedures set for in this Special Provision:

- (a) The bidder documents that enough DBE participation has been obtained to meet the goal: or
- (b) The bidder documents that a good faith effort has been made to meet the goal, even though the effort did not succeed in obtaining enough DBE participation to meet the goal.

DBE LOCATOR REFERENCES. Bidders shall consult the IL UCP DBE Directory as a reference source for DBE-certified companies. In addition, the Department maintains a letting and item specific DBE locator information system whereby DBE companies can register their interest in providing quotes on particular bid items advertised for letting. Information concerning DBE companies willing to quote work for particular contracts may be obtained by contacting the Department's Bureau of Small Business Enterprises at telephone number (217)785-4611, or by visiting the Department's website at [www.dot.il.gov](http://www.dot.il.gov).

BIDDING PROCEDURES. Compliance with this Special Provision is a material bidding requirement. The failure of the bidder to comply will render the bid not responsive.

- (a) The bidder shall submit a Disadvantaged Business Utilization Plan on Department forms SBE 2025 and 2026 with the bid.
- (b) The Utilization Plan shall indicate that the bidder either has obtained sufficient DBE participation commitments to meet the contract goal or has not obtained enough DBE participation commitments in spite of a good faith effort to meet the goal. The Utilization Plan shall further provide the name, telephone number, and telefax number of a responsible official of the bidder designated for purposes of notification of plan approval or disapproval under the procedures of this Special Provision.



- (c) The Utilization Plan shall include a DBE Participation Commitment Statement, Department form SBE 2025, for each DBE proposed for the performance of work to achieve the contract goal. For bidding purposes, submission of the completed SBE 2025 forms, signed by the DBEs and faxed to the bidder will be acceptable as long as the original is available and provided upon request. All elements of information indicated on the said form shall be provided, including but not limited to the following:
- (1) The names and addresses of DBE firms that will participate in the contract;
  - (2) A description, including pay item numbers, of the work each DBE will perform;
  - (3) The dollar amount of the participation of each DBE firm participating. The dollar amount of participation for identified work shall specifically state the quantity, unit price, and total subcontract price for the work to be completed by the DBE. If partial pay items are to be performed by the DBE, indicate the portion of each item, a unit price where appropriate and the subcontract price amount;
  - (4) DBE Participation Commitment Statements, form SBE 2025, signed by the bidder and each participating DBE firm documenting the commitment to use the DBE subcontractors whose participation is submitted to meet the contract goal;
  - (5) if the bidder is a joint venture comprised of DBE companies and non-DBE companies, the plan must also include a clear identification of the portion of the work to be performed by the DBE partner(s); and,
  - (6) If the contract goal if not met, evidence of good faith efforts.

GOOD FAITH EFFORT PROCEDURES. The contract will not be awarded until the Utilization Plan submitted by the apparent successful bidder is approved. All information submitted by the bidder must be complete, accurate and adequately document that enough DBE participation has been obtained or document that good faith efforts of the bidder, in the event enough DBE participation has not been obtained, before the Department will commit to the performance of the contract by the bidder. The Utilization Plan will be approved by the Department if the Utilization Plan documents sufficient commercially useful DBE work performance to meet the contract goal or the bidder submits sufficient documentation of a good faith effort to meet the contract goal pursuant to 49 CFR Part 26, Appendix A. The Utilization Plan will not be approved by the Department if the Utilization Plan does not document sufficient DBE participation to meet the contract goal unless the apparent successful bidder documented in the Utilization Plan that it made a good faith effort to meet the goal. This means that the bidder must show that all necessary and reasonable steps were taken to achieve the contract goal. Necessary and reasonable steps are those which, by their scope, intensity and appropriateness to the objective, could reasonably be expected to obtain sufficient DBE participation, even if they were not successful. The Department will consider the quality, quantity, and intensity of the kinds of efforts that the bidder has made. Mere *pro forma* efforts, in other words, efforts done as a matter of form, are not good faith efforts; rather, the bidder is expected to have taken genuine efforts that would be reasonably expected of a bidder actively and aggressively trying to obtain DBE participation sufficient to meet the contract goal.

- (a) The following is a list of types of action that the Department will consider as part of the evaluation of the bidder's good faith efforts to obtain participation. These listed factors are not intended to be a mandatory checklist and are not intended to be exhaustive. Other factors or efforts brought to the attention of the Department may be relevant in appropriate cases, and will be considered by the Department.
- (1) Soliciting through all reasonable and available means (e.g. attendance at pre-bid meetings, advertising and/or written notices) the interest of all certified DBE companies that have the capability to perform the work of the contract. The bidder must solicit this interest within sufficient time to allow the DBE companies to respond to the solicitation. The bidder must determine with certainty if the DBE companies are interested by taking appropriate steps to follow up initial solicitations.
  - (2) Selecting portions of the work to be performed by DBE companies in order to increase the likelihood that the DBE goals will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate DBE participation, even when the prime Contractor might otherwise prefer to perform these work items with its own forces.
  - (3) Providing interested DBE companies with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.
  - (4) a. Negotiating in good faith with interested DBE companies. It is the bidder's responsibility to make a portion of the work available to DBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DBE subcontractors and suppliers, so as to facilitate DBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of DBE companies that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for DBE companies to perform the work.
    - b. A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including DBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using DBE companies is not in itself sufficient reason for a bidder's failure to meet the contract DBE goal, as long as such costs are reasonable. Also the ability or desire of a bidder to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Bidders are not, however, required to accept higher quotes from DBE companies if the price difference is excessive or unreasonable.

- (5) Not rejecting DBE companies as being unqualified without sound reasons based on a thorough investigation of their capabilities. The bidder's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. non-union employee status) are not legitimate causes for the rejection or non-solicitation of bids in the bidder's efforts to meet the project goal.
  - (6) Making efforts to assist interested DBE companies in obtaining bonding, lines of credit, or insurance as required by the recipient or Contractor.
  - (7) Making efforts to assist interested DBE companies in obtaining necessary equipment, supplies, materials, or related assistance or services.
  - (8) Effectively using the services of available minority/women community organizations; minority/women contractors' groups; local, state, and federal minority/women business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of DBE companies.
- (b) If the Department determines that the apparent successful bidder has made a good faith effort to secure the work commitment of DBE companies to meet the contract goal, the Department will award the contract provided that it is otherwise eligible for award. If the Department determines that the bidder has failed to meet the requirements of this Special Provision or that a good faith effort has not been made, the Department will notify the responsible company official designated in the Utilization Plan that the bid is not responsive. The notification shall include a statement of reasons for the determination.
- (c) The bidder may request administrative reconsideration of a determination adverse to the bidder within the five working days after the receipt of the notification date of the determination by delivering the request to the Department of Transportation, Bureau of Small Business Enterprises, Contract Compliance Section, 2300 South Dirksen Parkway, Room 319, Springfield, Illinois 62764 (Telefax: (217)785-1524). Deposit of the request in the United States mail on or before the fifth business day shall not be deemed delivery. The determination shall become final if a request is not made and delivered. A request may provide additional written documentation and/or argument concerning the issues raised in the determination statement of reasons, provided the documentation and arguments address efforts made prior to submitting the bid. The request will be forwarded to the Department's Reconsideration Officer. The Reconsideration Officer will extend an opportunity to the bidder to meet in person in order to consider all issues of documentation and whether the bidder made a good faith effort to meet the goal. After the review by the Reconsideration Officer, the bidder will be sent a written decision within ten working days after receipt of the request for consideration, explaining the basis for finding that the bidder did or did not meet the goal or make adequate good faith efforts to do so. A final decision by the Reconsideration Officer that a good faith effort was made shall approve the Utilization Plan submitted by the bidder and shall clear the contract for award. A final decision that a good faith effort was not made shall render the bid not responsive.

CALCULATING DBE PARTICIPATION. The Utilization Plan values represent work anticipated to be performed and paid for upon satisfactory completion. The Department is only able to count toward the achievement of the overall goal and the contract goal the value of payments made for the work actually performed by DBE companies. In addition, a DBE must perform a commercially useful function on the contract to be counted. A commercially useful function is generally performed when the DBE is responsible for the work and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. The Department and Contractor are governed by the provisions of 49 CFR Part 26.55(c) on questions of commercially useful functions as it affects the work. Specific counting guidelines are provided in 49 CFR Part 26.55, the provisions of which govern over the summary contained herein.

- (a) DBE as the Contractor: 100 percent goal credit for that portion of the work performed by the DBE's own forces, including the cost of materials and supplies. Work that a DBE subcontracts to a non-DBE does not count toward the DBE goals.
- (b) DBE as a joint venture Contractor: 100 percent goal credit for that portion of the total dollar value of the contract equal to the distinct, clearly defined portion of the work performed by the DBE's own forces.
- (c) DBE as a subcontractor: 100 percent goal credit for the work of the subcontract performed by the DBE's own forces, including the cost of materials and supplies, excluding the purchase of materials and supplies or the lease of equipment by the DBE subcontractor from the prime Contractor or its affiliates. Work that a DBE subcontractor in turn subcontracts to a non-DBE does not count toward the DBE goal.
- (d) DBE as a trucker: 100 percent goal credit for trucking participation provided the DBE is responsible for the management and supervision of the entire trucking operation for which it is responsible. At least one truck owned, operated, licensed, and insured by the DBE must be used on the contract. Credit will be given for the following:
  - (1) The DBE may lease trucks from another DBE firm, including an owner-operator who is certified as a DBE. The DBE who leases trucks from another DBE receives credit for the total value of the transportation services the lessee DBE provides on the contract.
  - (2) The DBE may also lease trucks from a non-DBE firm, including from an owner-operator. The DBE who leases trucks from a non-DBE is entitled to credit only for the fee or commission is receives as a result of the lease arrangement.
- (e) DBE as a material supplier:
  - (1) 60 percent goal credit for the cost of the materials or supplies purchased from a DBE regular dealer.

- (2) 100 percent goal credit for the cost of materials of supplies obtained from a DBE manufacturer.
- (3) 100 percent credit for the value of reasonable fees and commissions for the procurement of materials and supplies if not a regular dealer or manufacturer.

CONTRACT COMPLIANCE. Compliance with this Special Provision is an essential part of the contract. The Department is prohibited by federal regulations from crediting the participation of a DBE included in the Utilization Plan toward either the contract goal or the Department's overall goal until the amount to be applied toward the goals has been paid to the DBE. The following administrative procedures and remedies govern the compliance by the Contractor with the contractual obligations established by the Utilization Plan. After approval of the Utilization Plan and award of the contract, the Utilization Plan and individual DBE Participation Statements become part of the contract. If the Contractor did not succeed in obtaining enough DBE participation to achieve the advertised contract goal, and the Utilization Plan was approved and contract awarded based upon a determination of good faith, the total dollar value of DBE work calculated in the approved Utilization Plan as a percentage of the awarded contract value shall become the amended contract goal. All work indicated for performance by an approved DBE shall be performed, managed, and supervised by the DBE executing the Participation Statement.

- (a) NO AMENDMENT. No amendment to the Utilization Plan may be made without prior written approval from the Department's Bureau of Small Business Enterprises. All requests for amendment to the Utilization Plan shall be submitted to the Department of Transportation, Bureau of Small Business Enterprises, Contract Compliance Section, 2300 South Dirksen Parkway, Room 319, Springfield, Illinois 62764. Telephone number (217)785-4611. Telefax number (217)785-1524.
- (b) TERMINATION OR REPLACEMENT. The Contractor shall not terminate or replace a DBE listed on the approved Utilization Plan, or perform with other forces work designated for a listed DBE except as provided in the Special Provision.
- (c) CHANGES TO WORK. Any deviation from the DBE condition-of-award or contract plans, specifications, or special provisions must be approved, in writing, by the Department as provided elsewhere in the Contract. The Contractor shall notify affected DBEs in writing of any changes in the scope of work which result in a reduction in the dollar amount condition-of-award to the contract. Where the revision includes work committed to a new DBE subcontractor, not previously involved in the project, then a Request for Approval of Subcontractor, Department form BC 260A, must be signed and submitted. If the commitment of work is in the form of additional tasks assigned to an existing subcontract, then a new Request for Approval of Subcontractor shall not be required. However, the Contractor must document efforts to assure that the existing DBE subcontractor is capable of performing the additional work and has agreed in writing to the change.

(d) ALTERNATIVE WORK METHODS. In addition to the above requirements for reductions in the condition of award, additional requirements apply to the two cases of Contractor-initiated work substitution proposals. Where the contract allows alternate work methods which serve to delete or create underruns in condition of award DBE work, and the Contractor selects that alternate method or, where the Contractor proposes a substitute work method or material that serves to diminish or delete work committed to a DBE and replace it with other work, then the Contractor must demonstrate one of the following:

- (1) That the replacement work will be performed by the same DBE (as long as the DBE is certified in the respective item of work) in a modification of the condition of award;  
or
- (2) That the DBE is aware that its work will be deleted or will experience underruns and has agreed in writing to the change. If this occurs, the Contractor shall substitute other work of equivalent value to a certified DBE or provide documentation of good faith efforts to do so; or
- (3) That the DBE is not capable of performing the replacement work or has declined to perform the work at a reasonable competitive price. If this occurs, the Contractor shall substitute other work of equivalent value to a certified DBE or provide documentation of good faith efforts to do so.

(e) TERMINATION AND REPLACEMENT PROCEDURES. The Contractor shall not terminate or replace a DBE subcontractor listed in the approved Utilization Plan without prior written consent. This includes, but is not limited to, instances in which the Contractor seeks to perform work originally designated for a DBE subcontractor with its own forces or those of an affiliate, a non-DBE firm, or with another DBE firm. Written consent will be granted only if the Bureau of Small Business Enterprises agrees, for reasons stated in its concurrence document, that the Contractor has good cause to terminate or replace the DBE firm. Before transmitting to the Bureau of Small Business Enterprises any request to terminate and/or substitute a DBE subcontractor, the Contractor shall give notice in writing to the DBE subcontractor, with a copy to the Bureau, of its intent to request to terminate and/or substitute, and the reason for the request. The Contractor shall give the DBE five days to respond to the Contractor's notice. The DBE so notified shall advise the Bureau and the Contractor of the reasons, if any, why it objects to the proposed termination of its subcontract and why the Bureau should not approve the Contractor's action. If required in a particular case as a matter of public necessity, the Bureau may provide a response period shorter than five days.

For purposes of this paragraph, good cause includes the following circumstances:

- (1) The listed DBE subcontractor fails or refuses to execute a written contract;

- (2) The listed DBE subcontractor fails or refuses to perform the work of its subcontract in a way consistent with normal industry standards. Provided, however, that good cause does not exist if the failure or refusal of the DBE subcontractor to perform its work on the subcontract results from the bad faith or discriminatory action of the prime contractor;
- (3) The listed DBE subcontractor fails or refuses to meet the prime Contractor's reasonable, nondiscriminatory bond requirements;
- (4) The listed DBE subcontractor becomes bankrupt, insolvent, or exhibits credit unworthiness;
- (5) The listed DBE subcontractor is ineligible to work on public works projects because of suspension and debarment proceedings pursuant 2 CFR Parts 180, 215 and 1,200 or applicable state law.
- (6) You have determined that the listed DBE subcontractor is not a responsible contractor;
- (7) The listed DBE subcontractor voluntarily withdraws from the projects and provides to you written notice of its withdrawal;
- (8) The listed DBE is ineligible to receive DBE credit for the type of work required;
- (9) A DBE owner dies or becomes disabled with the result that the listed DBE contractor is unable to complete its work on the contract;
- (10) Other documented good cause that compels the termination of the DBE subcontractor. Provided, that good cause does not exist if the prime Contractor seeks to terminate a DBE it relied upon to obtain the contract so that the prime Contractor can self-perform the work for which the DBE contractor was engaged or so that the prime Contractor can substitute another DBE or non-DBE contractor after contract award.

When a DBE is terminated, or fails to complete its work on the Contract for any reason the Contractor shall make a good faith effort to find another DBE to substitute for the original DBE to perform at least the same amount of work under the contract as the terminated DBE to the extent needed to meet the established Contract goal.

- (f) PAYMENT RECORDS. The Contractor shall maintain a record of payments for work performed to the DBE participants. The records shall be made available to the Department for inspection upon request. After the performance of the final item of work or delivery of material by a DBE and final payment therefore to the DBE by the Contractor, but not later than thirty calendar days after payment has been made by the Department to the Contractor for such work or material, the Contractor shall submit a DBE Payment Agreement on Department form SBE 2115 to the Regional Engineer. If full and final payment has not been made to the DBE, the DBE Payment Agreement shall indicate whether a disagreement as to the payment required exists between the Contractor and the DBE or if the Contractor believes that the work has not been satisfactorily completed. If the Contractor does not have the full amount of work indicated in the Utilization Plan performed by the BDE companies indicated in the Utilization Plan and after good faith efforts are reviewed, the Department may deduct from contract payments to the Contractor the amount of the goal not achieved as liquidated and ascertained damages. The Contractor may request an administrative reconsideration of any amount deducted as damages pursuant to subsection (h) of this part.
- (g) ENFORCEMENT. The Department reserves the right to withhold payment to the Contractor to enforce the provisions of this Special Provision. Final payment shall not be made on the contract until such time as the Contractor submits sufficient documentation demonstrating achievement of the goal in accordance with this Special Provision or after liquidated damages have been determined and collected.
- (h) RECONSIDERATION. Notwithstanding any other provision of the contract, including but not limited to Article 109.09 of the Standard Specifications, the Contractor may request administrative reconsideration of a decision to deduct the amount of the goal not achieved as liquidated damages. A request to reconsider shall be delivered to the Contract Compliance Section and shall be handled and considered in the same manner as set forth in paragraph (c) of "Good Faith Effort Procedures" of this Special Provision, except a final decision that a good faith effort was not made during contract performance to achieve the goal agreed to in the Utilization Plan shall be the final administrative decision of the Department.



**GRANULAR MATERIALS (BDE)**

Effective: November 1, 2012

Revise the title of Article 1003.04 of the Standard Specifications to read:

**“1003.04 Fine Aggregate for Bedding, Trench Backfill, Embankment, Porous Granular Backfill, Sand Backfill for Underdrains, and French Drains.”**

Revise Article 1003.04(c) of the Standard Specifications to read:

“(c) Gradation. The fine aggregate gradations for granular embankment, granular backfill, bedding, and trench backfill for pipe culverts and storm sewers shall be FA 1, FA 2, or FA 6 through FA 21.

The fine aggregate gradation for porous granular embankment, porous granular backfill, french drains, and sand backfill for underdrains shall be FA 1, FA 2, or FA 20, except the percent passing the No. 200 (75 µm) sieve shall be 2±2.”

Revise Article 1004.05(c) of the Standard Specifications to read:

“(c) Gradation. The coarse aggregate gradations shall be as follows.

Application	Gradation
Blotter	CA 15
Granular Embankment, Granular Backfill, Bedding, and Trench Backfill for Pipe Culverts and Storm Sewers	CA 6, CA 9, CA 10, CA 12, CA17, CA18, and CA 19
Porous Granular Embankment, Porous Granular Backfill, and French Drains	CA 7, CA 8, CA 11, CA 15, CA 16 and CA 18”

**HOT-MIX ASPHALT - DENSITY TESTING OF LONGITUDINAL JOINTS (BDE)**

Effective: January 1, 2010

Revised: April 1, 2012

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 ten feet 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%	91.0%
IL-9.5, IL-12.5	Ndesign ≥ 90	92.0 – 96.0%	90.0%
IL-9.5, IL-9.5L, IL-12.5	Ndesign < 90	92.5 – 97.4%	90.0%
IL-19.0, IL-25.0	Ndesign ≥ 90	93.0 – 96.0%	90.0%
IL-19.0, IL-19.0L, IL-25.0	Ndesign < 90	93.0 – 97.4%	90.0%
SMA	Ndesign = 50 & 80	93.5 – 97.4%	91.0%
All Other	Ndesign = 30	93.0 - 97.4%	90.0%”

**LIQUIDATED DAMAGES (BDE)**

Effective: April 1, 2013

Revise the table in Article 108.09 of the Standard Specifications to read:

"Schedule of Deductions for Each Day of Overrun in Contract Time			
Original Contract Amount		Daily Charges	
From More Than	To and Including	Calendar Day	Work Day
\$ 0	\$ 100,000	\$ 475	\$ 675
100,000	500,000	750	1,050
500,000	1,000,000	1,025	1,425
1,000,000	3,000,000	1,275	1,725
3,000,000	6,000,000	1,425	2,000
6,000,000	12,000,000	2,300	3,450
12,000,000	And over	6,775	9,525"

**LRFD STORM SEWER BURIAL TABLES (BDE)**

Effective: November 1, 2013

Revise Article 550.02 of the Standard Specifications to read as follows:

“Item	Article Section
(a) Clay Sewer Pipe .....	1040.02
(b) Extra Strength Clay Pipe .....	1040.02
(c) Concrete Sewer, Storm Drain, and Culvert Pipe .....	1042
(d) Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe .....	1042
(e) Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe (Note 1) .....	1042
(f) Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe (Note 1) .....	1042
(g) Polyvinyl Chloride (PVC) Pipe .....	1040.03
(h) Corrugated Polyvinyl Chloride (PVC) Pipe with a Smooth Interior .....	1040.03
(i) Corrugated Polypropylene (CPP) Pipe with Smooth Interior .....	1040.07
(j) Rubber Gaskets and Preformed Flexible Joint Sealants for Concrete Pipe .....	1056
(k) Mastic Joint Sealer for Pipe .....	1055
(l) External Sealing Band .....	1057
(m) Fine Aggregate (Note 2) .....	1003.04
(n) Coarse Aggregate (Note 3) .....	1004.05
(o) Reinforcement Bars and Welded Wire Fabric .....	1006.10
(p) Handling Hole Plugs .....	1042.16
(q) Polyethylene (PE) Pipe with a Smooth Interior .....	1040.04
(r) Corrugated Polyethylene (PE) Pipe with a Smooth Interior .....	1040.04

Note 1. The class of elliptical and arch pipe used for various storm sewer sizes and heights of fill shall conform to the requirements for circular pipe.

Note 2. The fine aggregate shall be moist.

Note 3. The coarse aggregate shall be wet.”

Revise the table for permitted materials in Article 550.03 of the Standard Specifications as follows:

"Class	<b>Materials</b>
A	Rigid Pipes: Clay Sewer Pipe Extra Strength Clay Pipe Concrete Sewer, Storm Drain, and Culvert Pipe Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
B	Rigid Pipes: Clay Sewer Pipe Extra Strength Clay Pipe Concrete Sewer, Storm Drain, and Culvert Pipe Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe Flexible Pipes: Polyvinyl Chloride (PVC) Pipe Corrugated Polyvinyl Chloride Pipe (PVC) with a Smooth Interior Polyethylene (PE) Pipe with a Smooth Interior Corrugated Polyethylene (PE) Pipe with a Smooth Interior Corrugated Polypropylene (CPP) Pipe with a Smooth Interior"

Replace the storm sewers tables in Article 550.03 of the Standard Specifications with the following:

STORM SEWERS KIND OF MATERIAL PERMITTED AND STRENGTH REQUIRED FOR A GIVEN PIPE DIAMETERS AND FILL HEIGHTS OVER THE TOP OF THE PIPE																
Nominal Diameter in.	Type 1								Type 2							
	Fill Height: 3' and less With 1' minimum cover								Fill Height: Greater than 3' not exceeding 10'							
	RCCP	CSP	ESCP	PVC	CPVC	PE	CPE	CPP	RCCP	CSP	ESCP	PVC	CPVC	PE	CPE	CPP
10	NA	3	X	X	X	X	X	NA	NA	1	*X	X	X	X	X	NA
12	IV	NA	X	X	X	X	X	X	II	1	*X	X	X	X	X	X
15	IV	NA	NA	X	X	NA	X	X	II	1	*X	X	X	NA	X	X
18	IV	NA	NA	X	X	X	X	X	II	2	X	X	X	X	X	X
21	III	NA	NA	X	X	NA	NA	NA	II	2	X	X	X	NA	NA	NA
24	III	NA	NA	X	X	X	X	X	II	2	X	X	X	X	X	X
27	III	NA	NA	NA	NA	NA	NA	NA	II	3	X	NA	NA	NA	NA	NA
30	IV	NA	NA	X	X	X	X	X	II	3	X	X	X	X	X	X
33	III	NA	NA	NA	NA	NA	NA	NA	II	NA	X	NA	NA	NA	NA	NA
36	III	NA	NA	X	X	X	X	X	II	NA	X	X	X	X	NA	X
42	II	NA	X	X	NA	X	X	NA	II	NA	X	X	NA	X	NA	NA
48	II	NA	X	X	NA	X	X	X	II	NA	X	X	NA	X	NA	NA
54	II	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA
60	II	NA	NA	NA	NA	NA	NA	X	II	NA	NA	NA	NA	NA	NA	X
66	II	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA
72	II	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA
78	II	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA
84	II	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA
90	II	NA	NA	NA	NA	NA	NA	NA	III	NA	NA	NA	NA	NA	NA	NA
96	II	NA	NA	NA	NA	NA	NA	NA	III	NA	NA	NA	NA	NA	NA	NA
102	II	NA	NA	NA	NA	NA	NA	NA	III	NA	NA	NA	NA	NA	NA	NA
108	II	NA	NA	NA	NA	NA	NA	NA	III	NA	NA	NA	NA	NA	NA	NA

- RCCP Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
- CSP Concrete Sewer, Storm drain, and Culvert Pipe
- PVC Polyvinyl Chloride Pipe
- CPVC Corrugated Polyvinyl Chloride Pipe
- ESCP Extra Strength Clay Pipe
- PE Polyethylene Pipe with a Smooth Interior
- CPE Corrugated Polyethylene Pipe with a Smooth Interior
- CPP Corrugated Polypropylene pipe with a Smooth Interior
- X This material may be used for the given pipe diameter and fill height.
- NA This material is Not Acceptable for the given pipe diameter and fill height.
- \* May also use Standard Strength Clay Pipe

STORM SEWERS (Metric)																
KIND OF MATERIAL PERMITTED AND STRENGTH REQUIRED																
FOR A GIVEN PIPE DIAMETERS AND FILL HEIGHTS OVER THE TOP OF THE PIPE																
Nominal Diameter in.	Type 1								Type 2							
	Fill Height: 1 m' and less With 300 mm minimum cover								Fill Height: Greater than 1 m not exceeding 3 m							
	RCCP	CSP	ESCP	PVC	CPVC	PE	CPE	CPP	RCCP	CSP	ESCP	PVC	CPVC	PE	CPE	CPP
250	NA	3	X	X	X	X	X	NA	NA	1	*X	X	X	X	X	NA
300	IV	NA	X	X	X	X	X	X	II	1	*X	X	X	X	X	X
375	IV	NA	NA	X	X	NA	X	X	II	1	*X	X	X	NA	X	X
450	IV	NA	NA	X	X	X	X	X	II	2	X	X	X	X	X	X
525	III	NA	NA	X	X	NA	NA	NA	II	2	X	X	X	NA	NA	NA
600	III	NA	NA	X	X	X	X	X	II	2	X	X	X	X	X	X
675	III	NA	NA	NA	NA	NA	NA	NA	II	3	X	NA	NA	NA	NA	NA
750	IV	NA	NA	X	X	X	X	X	II	3	X	X	X	X	X	X
825	III	NA	NA	NA	NA	NA	NA	NA	II	NA	X	NA	NA	NA	NA	NA
900	III	NA	NA	X	X	X	X	X	II	NA	X	X	X	X	NA	X
1050	II	NA	X	X	NA	X	X	NA	II	NA	X	X	NA	X	NA	NA
1200	II	NA	X	X	NA	X	X	X	II	NA	X	X	NA	X	NA	NA
1350	II	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA
1500	II	NA	NA	NA	NA	NA	NA	X	II	NA	NA	NA	NA	NA	NA	X
1650	II	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA
1800	II	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA
1950	II	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA
2100	II	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA
2250	II	NA	NA	NA	NA	NA	NA	NA	III	NA	NA	NA	NA	NA	NA	NA
2400	II	NA	NA	NA	NA	NA	NA	NA	III	NA	NA	NA	NA	NA	NA	NA
2550	II	NA	NA	NA	NA	NA	NA	NA	III	NA	NA	NA	NA	NA	NA	NA
2700	II	NA	NA	NA	NA	NA	NA	NA	III	NA	NA	NA	NA	NA	NA	NA

- RCCP Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
- CSP Concrete Sewer, Storm drain, and Culvert Pipe
- PVC Polyvinyl Chloride Pipe
- CPVC Corrugated Polyvinyl Chloride Pipe
- ESCP Extra Strength Clay Pipe
- PE Polyethylene Pipe with a Smooth Interior
- CPE Corrugated Polyethylene Pipe with a Smooth Interior
- CPP Corrugated Polypropylene pipe with a Smooth Interior
- X This material may be used for the given pipe diameter and fill height.
- NA This material is Not Acceptable for the given pipe diameter and fill height.
- \* May also use Standard Strength Clay Pipe

STORM SEWERS KIND OF MATERIAL PERMITTED AND STRENGTH REQUIRED FOR A GIVEN PIPE DIAMETERS AND FILL HEIGHTS OVER THE TOP OF THE PIPE															
Nominal Diameter in.	Type 3								Type 4						
	Fill Height: Greater than 10' not exceeding 15'								Fill Height: Greater than 15' not exceeding 20'						
	RCCP	CSP	ESCP	PVC	CPVC	PE	CPE	CPP	RCCP	CSP	ESCP	PVC	CPVC	PE	CPP
10	NA	2	X	X	X	X	X	NA	NA	3	X	X	X	X	NA
12	III	2	X	X	X	X	NA	X	IV	NA	NA	X	X	X	NA
15	III	3	X	X	X	NA	NA	X	IV	NA	NA	X	X	NA	X
18	III	NA	X	X	X	X	NA	X	IV	NA	NA	X	X	X	NA
21	III	NA	NA	X	X	NA	NA	NA	IV	NA	NA	X	X	NA	NA
24	III	NA	NA	X	X	X	NA	NA	IV	NA	NA	X	X	X	NA
27	III	NA	NA	NA	NA	NA	NA	NA	IV	NA	NA	NA	NA	NA	NA
30	III	NA	NA	X	X	X	NA	X	IV	NA	NA	X	X	X	NA
33	III	NA	NA	NA	NA	NA	NA	NA	IV	NA	NA	NA	NA	NA	NA
36	III	NA	NA	X	X	X	NA	NA	IV	NA	NA	X	X	X	NA
42	III	NA	NA	X	NA	X	NA	NA	IV	NA	NA	X	NA	X	NA
48	III	NA	NA	X	NA	X	NA	NA	IV	NA	NA	X	NA	X	NA
54	III	NA	NA	NA	NA	NA	NA	NA	IV	NA	NA	NA	NA	NA	NA
60	III	NA	NA	NA	NA	NA	NA	NA	IV	NA	NA	NA	NA	NA	NA
66	III	NA	NA	NA	NA	NA	NA	NA	IV	NA	NA	NA	NA	NA	NA
72	III	NA	NA	NA	NA	NA	NA	NA	IV	NA	NA	NA	NA	NA	NA
78	III	NA	NA	NA	NA	NA	NA	NA	IV	NA	NA	NA	NA	NA	NA
84	III	NA	NA	NA	NA	NA	NA	NA	IV	NA	NA	NA	NA	NA	NA
90	III	NA	NA	NA	NA	NA	NA	NA	1680	NA	NA	NA	NA	NA	NA
96	III	NA	NA	NA	NA	NA	NA	NA	1690	NA	NA	NA	NA	NA	NA
102	IV	NA	NA	NA	NA	NA	NA	NA	1700	NA	NA	NA	NA	NA	NA
108	1360	NA	NA	NA	NA	NA	NA	NA	1710	NA	NA	NA	NA	NA	NA

- RCCP Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
- CSP Concrete Sewer, Storm drain, and Culvert Pipe
- PVC Polyvinyl Chloride Pipe
- CPVC Corrugated Polyvinyl Chloride Pipe
- ESCP Extra Strength Clay Pipe
- PE Polyethylene Pipe with a Smooth Interior
- CPE Corrugated Polyethylene Pipe with a Smooth Interior
- CPP Corrugated Polypropylene pipe with a Smooth Interior
- X This material may be used for the given pipe diameter and fill height.
- NA This material is Not Acceptable for the given pipe diameter and fill height.
- \* May also use Standard Strength Clay Pipe



FAI 90/94/290(I-90/94/290)  
Project ACNHPP-0005(947)  
Section 2013-008R  
Cook County  
Contract 60W26

Note RCCP with a number instead of a Roman numeral shall be furnished according to AASHTO M170 Section 6. This number represents the D-load to produce a 0.01 in crack.

STORM SEWERS (metric) KIND OF MATERIAL PERMITTED AND STRENGTH REQUIRED FOR A GIVEN PIPE DIAMETERS AND FILL HEIGHTS OVER THE TOP OF THE PIPE																
Nominal Diameter in.	Type 3								Type 4							
	Fill Height: Greater than 3 m not exceeding 4.5 m								Fill Height: Greater than 4.5 m not exceeding 6 m							
	RCCP	CSP	ESCP	PVC	CPVC	PE	CPE	CPP	RCCP	CSP	ESCP	PVC	CPVC	PE	CPP	
250	NA	2	X	X	X	X	X	NA	NA	3	X	X	X	X	NA	
300	III	2	X	X	X	X	NA	X	IV	NA	NA	X	X	X	NA	
375	III	3	X	X	X	NA	NA	X	IV	NA	NA	X	X	NA	X	
450	III	NA	X	X	X	X	NA	X	IV	NA	NA	X	X	X	NA	
525	III	NA	NA	X	X	NA	NA	NA	IV	NA	NA	X	X	NA	NA	
600	III	NA	NA	X	X	X	NA	NA	IV	NA	NA	X	X	X	NA	
675	III	NA	NA	NA	NA	NA	NA	NA	IV	NA	NA	NA	NA	NA	NA	
750	III	NA	NA	X	X	X	NA	X	IV	NA	NA	X	X	X	NA	
825	III	NA	NA	NA	NA	NA	NA	NA	IV	NA	NA	NA	NA	NA	NA	
900	III	NA	NA	X	X	X	NA	NA	IV	NA	NA	X	X	X	NA	
1050	III	NA	NA	X	NA	X	NA	NA	IV	NA	NA	X	NA	X	NA	
1200	III	NA	NA	X	NA	X	NA	NA	IV	NA	NA	X	NA	X	NA	
1350	III	NA	NA	NA	NA	NA	NA	NA	IV	NA	NA	NA	NA	NA	NA	
1500	III	NA	NA	NA	NA	NA	NA	NA	IV	NA	NA	NA	NA	NA	NA	
1650	III	NA	NA	NA	NA	NA	NA	NA	IV	NA	NA	NA	NA	NA	NA	
1800	III	NA	NA	NA	NA	NA	NA	NA	IV	NA	NA	NA	NA	NA	NA	
1950	III	NA	NA	NA	NA	NA	NA	NA	IV	NA	NA	NA	NA	NA	NA	
2100	III	NA	NA	NA	NA	NA	NA	NA	IV	NA	NA	NA	NA	NA	NA	
2250	III	NA	NA	NA	NA	NA	NA	NA	80	NA	NA	NA	NA	NA	NA	
2400	III	NA	NA	NA	NA	NA	NA	NA	80	NA	NA	NA	NA	NA	NA	
2550	IV	NA	NA	NA	NA	NA	NA	NA	80	NA	NA	NA	NA	NA	NA	
2700	70	NA	NA	NA	NA	NA	NA	NA	80	NA	NA	NA	NA	NA	NA	

- RCCP Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
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- ESCP Extra Strength Clay Pipe
- PE Polyethylene Pipe with a Smooth Interior
- CPE Corrugated Polyethylene Pipe with a Smooth Interior
- CPP Corrugated Polypropylene pipe with a Smooth Interior
- X This material may be used for the given pipe diameter and fill height.
- NA This material is Not Acceptable for the given pipe diameter and fill height.
- \* May also use Standard Strength Clay Pipe
- Note RCCP with a number instead of a Roman numeral shall be furnished according to AASHTO M170 Section 6. This number represents the metric D-load to produce a 25.4 micro-meter crack.

STORM SEWERS KIND OF MATERIAL PERMITTED AND STRENGTH REQUIRED FOR A GIVEN PIPE DIAMETERS AND FILL HEIGHTS OVER THE TOP OF THE PIPE								
Nominal Diameter in.	Type 5			Type 6			Type 7	
	Fill Height: Greater than 20' not exceeding 25'			Fill Height: Greater than 25' not exceeding 30'			Fill Height: Greater than 30' not exceeding 35'	
	RCCP	PVC	CPVC	RCCP	PVC	CPVC	RCCP	CPVC
10	NA	X	X	NA	X	X	NA	X
12	IV	X	X	V	X	X	V	X
15	IV	X	X	V	X	X	V	X
18	IV	X	X	V	X	X	V	X
21	IV	X	X	V	X	X	V	X
24	IV	X	X	V	X	X	V	X
27	IV	NA	NA	V	NA	NA	V	NA
30	IV	X	X	V	X	X	V	X
33	IV	NA	NA	V	NA	NA	V	NA
36	IV	X	X	V	X	X	V	X
42	IV	X	NA	V	X	NA	V	NA
48	IV	X	NA	V	X	NA	V	NA
54	IV	NA	NA	V	NA	NA	V	NA
60	IV	NA	NA	V	NA	NA	V	NA
66	IV	NA	NA	V	NA	NA	V	NA
72	V	NA	NA	V	NA	NA	V	NA
78	2020	NA	NA	2370	NA	NA	2730	NA
84	2020	NA	NA	2380	NA	NA	2740	NA
90	2030	NA	NA	2390	NA	NA	2750	NA
96	2040	NA	NA	2400	NA	NA	2750	NA
102	2050	NA	NA	2410	NA	NA	2760	NA
108	2060	NA	NA	2410	NA	NA	2770	NA

RCCP Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe

PVC Polyvinyl Chloride Pipe

CPVC Corrugated Polyvinyl Chloride Pipe

ESCP Extra Strength Clay Pipe

X This material may be used for the given pipe diameter and fill height.

NA This material is Not Acceptable for the given pipe diameter and fill height.

Note RCCP with a number instead of a Roman numeral shall be furnished according to AASHTO M170 Section 6. This number represents the D-load to produce a 0.01 in crack.

STORM SEWERS (metric) KIND OF MATERIAL PERMITTED AND STRENGTH REQUIRED FOR A GIVEN PIPE DIAMETERS AND FILL HEIGHTS OVER THE TOP OF THE PIPE								
Nominal Diameter in.	Type 5			Type 6			Type 7	
	Fill Height: Greater than 20' not exceeding 25'			Fill Height: Greater than 25' not exceeding 30'			Fill Height: Greater than 30' not exceeding 35'	
	RCCP	PVC	CPVC	RCCP	PVC	CPVC	RCCP	CPVC
250	NA	X	X	NA	X	X	NA	X
300	IV	X	X	V	X	X	V	X
375	IV	X	X	V	X	X	V	X
450	IV	X	X	V	X	X	V	X
525	IV	X	X	V	X	X	V	X
600	IV	X	X	V	X	X	V	X
675	IV	NA	NA	V	NA	NA	V	NA
750	IV	X	X	V	X	X	V	X
825	IV	NA	NA	V	NA	NA	V	NA
900	IV	X	X	V	X	X	V	X
1050	IV	X	NA	V	X	NA	V	NA
1200	IV	X	NA	V	X	NA	V	NA
1350	IV	NA	NA	V	NA	NA	V	NA
1500	IV	NA	NA	V	NA	NA	V	NA
1650	IV	NA	NA	V	NA	NA	V	NA
1800	V	NA	NA	V	NA	NA	V	NA
1950	100	NA	NA	110	NA	NA	130	NA
2100	100	NA	NA	110	NA	NA	130	NA
2250	100	NA	NA	110	NA	NA	130	NA
2400	100	NA	NA	120	NA	NA	130	NA
2550	100	NA	NA	120	NA	NA	130	NA
2700	100	NA	NA	120	NA	NA	130	NA

RCCP Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe

PVC Polyvinyl Chloride Pipe

CPVC Corrugated Polyvinyl Chloride Pipe

ESCP Extra Strength Clay Pipe

X This material may be used for the given pipe diameter and fill height.

NA This material is Not Acceptable for the given pipe diameter and fill height.

Note RCCP with a number instead of a Roman numeral shall be furnished according to AASHTO M170 Section 6. This number represents the metric D-load to produce a 25.4 micro-meter crack.

Revise the sixth paragraph of Article 550.06 of the Standard Specifications to read:

“PVC, PE and CPP pipes shall be joined according to the manufacturer’s specifications.”

Revise the first and second paragraphs of Article 550.08 of the Standard Specifications to read:

“**550.08 Deflection Testing for Storm Sewers.** All PVC, PE, and CPP storm sewers shall be tested for deflection not less than 30 days after the pipe is installed and the backfill compacted. The testing shall be performed in the presence of the Engineer.

For PVC, PE, and CPP storm sewers with diameters 24 in. (600 mm) or smaller, a mandrel drag shall be used for deflection testing. For PVC, PE, and CPP storm sewers with diameters over 24 in. (600 mm), deflection measurements other than by a mandrel shall be used.”

Revise the fifth paragraph of Article 550.08 to read as follows.

“The outside diameter of the mandrel shall be 95 percent of the base inside diameter. For all PVC pipe the base inside diameter shall be defined using ASTM D 3034 methodology. For all PE and CPP pipe, the base inside diameter shall be defined as the average inside diameter based on the minimum and maximum tolerances specified in the corresponding ASTM or AASHTO material specifications.”

Revise the first paragraph of Article 1040.03 of the Standard Specifications to read:

“**1040.03 Polyvinyl Chloride (PVC) Pipe.** Acceptance testing of PVC pipe and fittings shall be accomplished during the same construction season in which they are installed. The section properties shall be according to the manufacturer pre-submitted geometric properties on file with the Department. The manufacturer shall submit written certification that the material meets those properties. The pipe shall meet the following additional requirements.”

Delete Articles 1040.03(e) and (f) of the Standard Specifications.

Revise Articles 1040.04(c) and (d) of the Standard Specifications to read:

“(c) PE Profile Wall Pipe for Insertion Lining. The pipe shall be according to ASTM F 894. When used for insertion lining of pipe culverts, the pipe liner shall have a minimum pipe stiffness of 46 psi (317 kPa) at five percent deflection for nominal inside diameters of 42 in. (1050 mm) or less. For nominal inside diameters of greater than 42 in. (1050 mm), the pipe liner shall have a minimum pipe stiffness of 32.5 psi (225 kPa) at five percent deflection. All sizes shall have wall construction that presents essentially smooth internal and external surfaces.

- (d) PE Pipe with a Smooth Interior. The pipe shall be according to ASTM F 714 (DR 32.5) with a minimum cell classification of PE 335434 as defined in ASTM D 3350. The section properties shall be according to the manufacturer pre-submitted geometric properties on file with the Department. The manufacturer shall submit written certification that the material meets those properties and the resin used to manufacture the pipe meets or exceeds the minimum cell classification requirements.”

Add the following to Section 1040 of the Standard Specifications:

**“1040.08 Polypropylene (PP) Pipe.** Storage and handling shall be according to the manufacturer’s recommendations, except in no case shall the pipe be exposed to direct sunlight for more than six months. Acceptance testing of the pipe shall be accomplished during the same construction season in which it is installed. The section properties shall be according to the manufacturer pre-submitted geometric properties on file with the Department. The manufacturer shall submit written certification that the material meets those properties. The pipe shall meet the following additional requirements.

- (a) Corrugated PP Pipe with a Smooth Interior. The pipe shall be according to AAHSTO M 330 (nominal size – 12 to 60 in. (300 to 1500 mm)). The pipe shall be Type S or D.
- (b) Perforated Corrugated PP Pipe with A Smooth Interior. The pipe shall be according to AASHTO M 330 (nominal size – 12 to 60 in. (300 to 1500 mm)). The pipe shall be Type SP. In addition, the top centerline of the pipe shall be marked so that it is readily visible from the top of the trench before backfilling, and the upper ends of the slot perforations shall be a minimum of ten degrees below the horizontal.”

#### **PAVEMENT MARKING REMOVAL (BDE)**

Effective: April 1, 2009

Add the following to the end of the first paragraph of Article 783.03(a) of the Standard Specifications:

“The use of grinders will not be allowed on new surface courses.”

**PAVEMENT REMOVAL (BDE)**

Effective: April 1, 2013

Revise Article 440.07(c) of the Standard Specifications to read:

“(c) Adjustment of Quantities. The quantity of pavement removal will be adjusted if the thickness of the existing pavement varies more than 15 percent from that shown on the plans. The quantity will be either increased or decreased according to the following table.

% change of thickness	% change of quantity
0 to less than 15	0
15 to less than 20	10
20 to less than 30	15
30 to less than 50	20

If the thickness of the existing pavement varies by 50 percent or more from that shown on the plans, the character of the work will be considered significantly changed and an adjustment to the contract will be made according to Article 104.02.

When an adjustment is made for variations in pavement thickness a resulting adjustment will also be made in the earthwork quantities when applicable.

No adjustment will be made for variations in the amount of reinforcement.”

**PAYMENTS TO SUBCONTRACTORS (BDE)**

Effective: June 1, 2000

Revised: January 1, 2006

Federal regulations found at 49 CFR §26.29 mandate the Department to establish a contract clause to require Contractors to pay subcontractors for satisfactory performance of their subcontracts and to set the time for such payments.

State law also addresses the timing of payments to be made to subcontractors and material suppliers. Section 7 of the Prompt Payment Act, 30 ILCS 540/7, requires that when a Contractor receives any payment from the Department, the Contractor shall make corresponding, proportional payments to each subcontractor and material supplier performing work or supplying material within 15 calendar days after receipt of the Department payment. Section 7 of the Act further provides that interest in the amount of two percent per month, in addition to the payment due, shall be paid to any subcontractor or material supplier by the Contractor if the payment required by the Act is withheld or delayed without reasonable cause. The Act also provides that the time for payment required and the calculation of any interest due applies to transactions between subcontractors and lower-tier subcontractors and material suppliers throughout the contracting chain.

This Special Provision establishes the required federal contract clause, and adopts the 15 calendar day requirement of the State Prompt Payment Act for purposes of compliance with the federal regulation regarding payments to subcontractors. This contract is subject to the following payment obligations.

When progress payments are made to the Contractor according to Article 109.07 of the Standard Specifications, the Contractor shall make a corresponding payment to each subcontractor and material supplier in proportion to the work satisfactorily completed by each subcontractor and for the material supplied to perform any work of the contract. The proportionate amount of partial payment due to each subcontractor and material supplier throughout the contracting chain shall be determined by the quantities measured or otherwise determined as eligible for payment by the Department and included in the progress payment to the Contractor. Subcontractors and material suppliers shall be paid by the Contractor within 15 calendar days after the receipt of payment from the Department. The Contractor shall not hold retainage from the subcontractors. These obligations shall also apply to any payments made by subcontractors and material suppliers to their subcontractors and material suppliers; and to all payments made to lower tier subcontractors and material suppliers throughout the contracting chain. Any payment or portion of a payment subject to this provision may only be withheld from the subcontractor or material supplier to whom it is due for reasonable cause.

This Special Provision does not create any rights in favor of any subcontractor or material supplier against the State or authorize any cause of action against the State on account of any payment, nonpayment, delayed payment, or interest claimed by application of the State Prompt Payment Act. The Department will not approve any delay or postponement of the 15 day requirement except for reasonable cause shown after notice and hearing pursuant to Section 7(b) of the State Prompt Payment Act. State law creates other and additional remedies available to any subcontractor or material supplier, regardless of tier, who has not been paid for work properly performed or material furnished. These remedies are a lien against public funds set forth in Section 23(c) of the Mechanics Lien Act, 770 ILCS 60/23(c), and a recovery on the Contractor's payment bond according to the Public Construction Bond Act, 30 ILCS 550.

## **PLACING AND CONSOLIDATING CONCRETE (BDE)**

Effective: January 1, 2013

Revise the first paragraph of Article 503.06 of the Standard Specifications to read:

**“503.06 Forms.** Forms shall be set and maintained to the lines and grades shown on the plans, and shall be tight to prevent concrete leakage.”



Revise Article 503.07 of the Standard Specifications to read:

“ **503.07 Placing and Consolidating.** No concrete shall be placed on ice, snow, or frozen foundation material.

The method and manner of placing concrete shall be such as to avoid segregation or separation of the aggregates or the displacement of the reinforcement. 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 honeycomb and with a minimum of water and air pockets.

Open troughs and chutes shall extend as nearly as practicable to the point of deposit. Dropping the concrete a distance of more than 5 ft (1.5 m) or depositing a large quantity at any point and running or working it along the forms will not be permitted. The concrete for walls with an average thickness of 12 in. (300 mm) or less shall be placed with tubes so that the drop is not greater than 5 ft (1.5 m).

For self-consolidating concrete, the maximum distance of horizontal flow from the point of deposit shall be 15 ft (4.6 m). The distance may be increased if the dynamic segregation index (DSI) at the maximum flow distance is 10.0 percent or less according to Illinois Test Procedure SCC-8 (Option C). The maximum distance using the DSI shall be 25 ft (7.6 m). In addition, this specified horizontal flow distance shall apply to precast products. In the case of precast prestressed concrete products, refer to the Department's "Manual of Fabrication for Precast Prestressed Concrete Products" for the specified horizontal flow distance requirements.

When the form height for placing the self-consolidating concrete is greater than 10 ft (3.0 m), direct monitoring of form pressure shall be performed by the Contractor according to Illinois Test Procedure SCC-10. The monitoring requirement is a minimum, and the Contractor shall remain responsible for adequate design of the falsework and forms. The Contractor shall record the formwork pressure during concrete placement. This information shall be used by the Contractor to prevent the placement rate from exceeding the maximum formwork pressure allowed, to monitor the thixotropic change in the concrete during the pour, and to make appropriate adjustments to the mix design. This information shall be provided to the Engineer during the pour.

When concrete is pumped, the equipment shall be suitable in kind and adequate in capacity for the work and arranged so that vibrations will not damage freshly placed concrete. Aluminum pipe or conduit will not be permitted in pumping or placing concrete. Mixed concrete shall be supplied to maintain continuous operation of the pumping equipment.

When air entrained concrete is pumped, an accessory or accessories shall be incorporated in the discharge components to minimize air loss. The maximum allowable air loss caused by the pumping operation shall be 3.0 percent with the minimum air content at the point of discharge meeting the requirements of Article 1020.04.

Placing of concrete shall be regulated so that the pressures caused by the wet concrete will not exceed those used in the design of the forms. Special care shall be taken to fill each part of the forms by depositing the concrete as near its final position as possible, to work the coarser aggregates back from the face, and to force the concrete under and around the reinforcement bars without displacing them. Leakage through forms onto beams or girders shall not be allowed to harden and shall be removed while in a plastic state.

The concrete shall be consolidated by internal vibration unless self-consolidating concrete is used. Self-consolidating concrete may be used for inaccessible locations where consolidation by internal vibration is not practicable. The self consolidating concrete shall be rodded with a piece of lumber, conduit, or vibrator if the material has lost its fluidity prior to placement of additional concrete. The vibrator may only be permitted if it can be used in a manner that does not cause segregation as determined by the Engineer. Any other method for restoring the fluidity of the concrete shall be approved by the Engineer.

The Contractor shall provide and use a sufficient number of vibrators to ensure that consolidation can be started immediately after the concrete has been deposited in the forms.

The vibrators shall be inserted into the concrete immediately after it is deposited and shall be moved throughout the mass so as to thoroughly work the concrete around the reinforcement, embedded fixtures, and into the corners and angles of the forms. Vibrators shall not be attached to the forms, reinforcement bars, or the surface of the concrete.

Application of vibrators shall be at points uniformly spaced and not farther apart than twice the radius over which the vibration is visibly effective. The duration of the vibration at the points of insertion shall be sufficient to thoroughly consolidate the concrete into place but shall not be continued so as to cause segregation. When consolidating concrete in bridge decks, the vibrator shall be vertically inserted into the concrete for 3 - 5 seconds or for a period of time determined by the Engineer. Vibration shall be supplemented by spading when required by the Engineer. In addition to the internal vibration required herein, formed surfaces which will be exposed to view after completion of the work shall be spaded with a spading tool approved by the Engineer.

Concrete shall be placed in continuous horizontal layers. When it is necessary by reason of an emergency to place less than a complete horizontal layer in one operation, such layer shall terminate in a vertical bulkhead. Separate batches shall follow each other closely and in no case shall the interval of time between the placing of successive batches be greater than 20 minutes.

If mix foaming or detrimental material is observed during placement or at the completion of a pour, the material shall be removed while the concrete is still plastic

After the concrete has taken its initial set, care shall be exercised to avoid jarring the forms or placing any strain on the ends of projecting reinforcement.”

Revise Article 516.12(a) of the Standard Specifications to read:

“(a) Free Fall Placement. The free fall placement shall only be permitted in shafts that can be dewatered to ensure less than 3 in. (75 mm) of standing water exist at the time of placement without causing side wall instability. The height of free fall placement shall be a maximum of 60 ft (18.3 m) as measured from the discharge end, but it shall be reduced to a maximum of 30 ft (9.1 m) when self-consolidating concrete is used. The Contractor shall obtain approval from the Engineer to place self-consolidating concrete by free fall.

Concrete placed by free fall shall fall directly to the base without contacting either the rebar cage or shaft sidewall. Drop chutes may be used to direct concrete to the base during free fall placement.

Drop chutes used to direct placement of free fall concrete shall consist of a smooth tube of either one continuous section or multiple pieces that can be added and removed. Concrete may be placed through either a hopper at the top of the tube or side openings as the drop chute is retrieved during concrete placement. The drop chute shall be supported so that free fall does not exceed the specified maximum 60 ft (18.3 m) or 30 ft (9.1 m) at all times from the discharge end, and to ensure the concrete does not strike the rebar cage. If placement cannot be satisfactorily accomplished by free fall in the opinion of the Engineer, either a tremie or pump shall be used to accomplish the pour.”

## **POLYUREA PAVEMENT MARKINGS (BDE)**

Effective: November 1, 2012

Revise: January 1, 2013

Revise the first paragraph of Article 780.13 of the Standard Specifications to read:

“**780.13 Basis of Payment.** This work will be paid for at the contract unit prices per foot (meter) of applied line width, as specified, for THERMOPLASTIC PAVEMENT MARKING - LINE; PAINT PAVEMENT MARKING - LINE; EPOXY PAVEMENT MARKING - LINE; PREFORMED PLASTIC PAVEMENT MARKING - LINE - TYPE B, C, or B - INLAID; PREFORMED THERMOPLASTIC PAVEMENT MARKING - LINE, POLYUREA PAVEMENT MARKING TYPE I - LINE, POLYUREA PAVEMENT MARKING TYPE II - LINE; and/or per square foot (square meter) for THERMOPLASTIC PAVEMENT MARKING - LETTERS AND SYMBOLS; PAINT PAVEMENT MARKING - LETTERS AND SYMBOLS; EPOXY PAVEMENT MARKING - LETTERS AND SYMBOLS; PREFORMED PLASTIC PAVEMENT MARKING - TYPE B, C, or B - INLAID - LETTERS AND SYMBOLS; PREFORMED THERMOPLASTIC PAVEMENT MARKING - LETTERS AND SYMBOLS; POLYUREA PAVEMENT MARKING TYPE I - LETTERS AND SYMBOLS; POLYUREA PAVEMENT MARKING TYPE II - LETTERS AND SYMBOLS.”

## PORTLAND CEMENT CONCRETE (BDE)

Effective: January 1, 2012

Revised: November 1, 2013

Revise Notes 1 and 2 of Article 312.24 of the Standard Specifications to read:

“Note 1. Coarse aggregate shall be gradation CA 6, CA 7, CA 9, CA 10, or CA 11, Class D quality or better. Article 1020.05(d) shall apply.

Note 2. Fine aggregate shall be FA 1 or FA 2. Article 1020.05(d) shall apply.”

Revise the first paragraph of Article 312.26 of the Standard Specifications to read:

“**312.26 Proportioning and Mix Design.** At least 60 days prior to start of placing CAM II, the Contractor shall submit samples of materials for proportioning and testing. The mixture shall contain a minimum of 200 lb (90 kg) of cement per cubic yard (cubic meter). Portland cement may be replaced with fly ash according to Article 1020.05(c)(1), however the minimum portland cement content in the mixture shall be 170 lbs/cu yd (101 kg/cu m). Blends of coarse and fine aggregates will be permitted, provided the volume of fine aggregate does not exceed the volume of coarse aggregate. The Engineer will determine the proportions of materials for the mixture. However, the Contractor may substitute their own mix design. Article 1020.05(a) shall apply and a Level III PCC Technician shall develop the mix design.”

Revise the second paragraph of Article 503.22 of the Standard Specifications to read:

Other cast-in-place concrete for structures will be paid for at the contract unit price per cubic yard (cubic meter) for CONCRETE HANDRAIL, CONCRETE ENCASUREMENT, and SEAL COAT CONCRETE.”

Add the following to Article 1003.02 of the Standard Specifications:

(e) Alkali Reaction.

(1) ASTM C 1260. Each fine aggregate will be tested by the Department for alkali reaction according to ASTM C 1260. The test will be performed with Type I or II portland cement having a total equivalent alkali content ( $\text{Na}_2\text{O} + 0.658\text{K}_2\text{O}$ ) of 0.90 percent or greater. The Engineer will determine the assigned expansion value for each aggregate, and these values will be made available on the Department's Alkali-Silica Potential Reactivity Rating List. The Engineer may differentiate aggregate based on ledge, production method, gradation number, or other factors. An expansion value of 0.03 percent will be assigned to limestone or dolomite fine aggregates (manufactured stone sand). However, the Department reserves the right to perform the ASTM C 1260 test.

- (2) ASTM C 1293 by Department. In some instances, such as chert natural sand or other fine aggregates, testing according to ASTM C 1260 may not provide accurate test results. In this case, the Department may only test according to ASTM C 1293.
- (3) ASTM C 1293 by Contractor. If an individual aggregate has an ASTM C 1260 expansion value that is unacceptable to the Contractor, an ASTM C 1293 test may be performed by the Contractor to evaluate the Department's ASTM C 1260 test result. The laboratory performing the ASTM C 1293 test shall be approved by the Department according to the current Bureau of Materials and Physical Research Policy Memorandum "Minimum Laboratory Requirements for Alkali-Silica Reactivity (ASR) Testing".

The ASTM C 1293 test shall be performed with Type I or II portland cement having a total equivalent alkali content ( $\text{Na}_2\text{O} + 0.658\text{K}_2\text{O}$ ) of 0.80 percent or greater. The interior vertical wall of the ASTM C 1293 recommended container (pail) shall be half covered with a wick of absorbent material consisting of blotting paper. If the testing laboratory desires to use an alternate container, wick of absorbent material, or amount of coverage inside the container with blotting paper, ASTM C 1293 test results with an alkali-reactive aggregate of known expansion characteristics shall be provided to the Engineer for review and approval. If the expansion is less than 0.040 percent after one year, the aggregate will be assigned an ASTM C 1260 expansion value of 0.08 percent that will be valid for two years, unless the Engineer determines the aggregate has changed significantly. If the aggregate is manufactured into multiple gradation numbers, and the other gradation numbers have the same or lower ASTM C 1260 value, the ASTM C 1293 test result may apply to multiple gradation numbers.

The Engineer reserves the right to verify a Contractor's ASTM C 1293 test result. When the Contractor performs the test, a split sample shall be provided to the Engineer. The Engineer may also independently obtain a sample at any time. The aggregate will be considered reactive if the Contractor or Engineer obtains an expansion value of 0.040 percent or greater.

Revise the first paragraph of Article 1004.01(e)(5) of the Standard Specifications to read:

"Crushed concrete, crushed slag, or lightweight aggregate for portland cement concrete shall be stockpiled in a moist condition (saturated surface dry or greater) and the moisture content shall be maintained uniformly throughout the stockpile by periodic sprinkling."

Revise Article 1004.02(d) of the Standard Specifications to read:

"(d)Combining Sizes. Each size shall be stored separately and care shall be taken to prevent them from being mixed until they are ready to be proportioned. Separate compartments shall be provided to proportion each size.

- (1) When Class BS concrete is to be pumped, the coarse aggregate gradation shall have a minimum of 45 percent passing the 1/2 in. (12.5 mm) sieve. The Contractor may combine two or more coarse aggregate sizes, consisting of CA 7, CA 11, CA 13, CA 14, and CA 16, provided a CA 7 or CA 11 is included in the blend.
- (2) If the coarse aggregate is furnished in separate sizes, they shall be combined in proportions to provide a uniformly graded coarse aggregate grading within the following limits.

Class of Concrete <sup>1/</sup>	Combined Sizes	Sieve Size and Percent Passing						
		2 1/2 in.	2 in.	1 3/4 in.	1 1/2 in.	1 in.	1/2 in.	No. 4
PV <sup>2/</sup>	CA 5 & CA 7	---	---	100	98±2	72±22	22±12	3±3
	CA 5 & CA 11	---	---	100	98±2	72±22	22±12	3±3
SI and SC <sup>2/</sup>	CA 3 & CA 7	100	95±5	---	---	55±25	20±10	3±3
	CA 3 & CA 11	100	95±5	---	---	55±25	20±10	3±3
	CA 5 & CA 7	---	---	100	98±2	72±22	22±12	3±3
	CA 5 & CA 11	---	---	100	98±2	72±22	22±12	3±3

Class of Concrete <sup>1/</sup>	Combined Sizes	Sieve Size (metric) and Percent Passing						
		63 mm	50 mm	45 mm	37.5 mm	25 mm	12.5 mm	4.75 mm
PV <sup>2/</sup>	CA 5 & CA 7	---	---	100	98±2	72±22	22±12	3±3
	CA 5 & CA 11	---	---	100	98±2	72±22	22±12	3±3
SI and SC <sup>2/</sup>	CA 3 & CA 7	100	95±5	---	---	55±25	20±10	3±3
	CA 3 & CA 11	100	95±5	---	---	55±25	20±10	3±3
	CA 5 & CA 7	---	---	100	98±2	72±22	22±12	3±3
	CA 5 & CA 11	---	---	100	98±2	72±22	22±12	3±3

1/ See Table 1 of Article 1020.04.

2/ Any of the listed combination of sizes may be used."

Add the following to Article 1004.02 of the Standard Specifications:

(g) Alkali Reaction.

- (1) ASTM C 1260. Each coarse aggregate will be tested by the Department for alkali reaction according to ASTM C 1260. The test will be performed with Type I or II portland cement having a total equivalent alkali content (Na<sub>2</sub>O + 0.658K<sub>2</sub>O) of 0.90 percent or greater. The Engineer will determine the assigned expansion value for each aggregate, and these values will be made available on the Department's Alkali-Silica Potential Reactivity Rating List. The Engineer may differentiate aggregate based on ledge, production method, gradation number, or other factors. An expansion value of 0.05 percent will be assigned to limestone or dolomite coarse aggregates. However, the Department reserves the right to perform the ASTM C 1260 test.

- (2) ASTM C 1293 by Department. In some instances testing a coarse aggregate according to ASTM C 1260 may not provide accurate test results. In this case, the Department may only test according to ASTM C 1293.
- (3) ASTM C 1293 by Contractor. If an individual aggregate has an ASTM C 1260 expansion value that is unacceptable to the Contractor, an ASTM C 1293 test may be performed by the Contractor according to Article 1003.02(e)(3).

Revise the first paragraph of Article 1019.06 of the Standard Specifications to read:

**“1019.06 Contractor Mix Design.** A Contractor may submit their own mix design and may propose alternate fine aggregate materials, fine aggregate gradations, or material proportions. Article 1020.05(a) shall apply and a Level III PCC Technician shall develop the mix design.”

Revise Section 1020 of the Standard Specifications to read:

**“SECTION 1020. PORTLAND CEMENT CONCRETE**

**1020.01 Description.** This item shall consist of the materials, mix design, production, testing, curing, low air temperature protection, and temperature control of concrete.

**1020.02 Materials.** Materials shall be according to the following.

Item	Article/Section
(a) Cement .....	1001
(b) Water .....	1002
(c) Fine Aggregate .....	1003
(d) Coarse Aggregate .....	1004
(e) Concrete Admixtures .....	1021
(f) Finely Divided Minerals .....	1010
(g) Concrete Curing Materials .....	1022
(h) Straw .....	1081.06(a)(1)
(i) Calcium Chloride .....	1013.01

**1020.03 Equipment.** Equipment shall be according to the following.

Item	Article/Section
(a) Concrete Mixers and Trucks .....	1103.01
(b) Batching and Weighing Equipment .....	1103.02
(c) Automatic and Semi-Automatic Batching Equipment .....	1103.03
(d) Water Supply Equipment .....	1103.11
(e) Membrane Curing Equipment .....	1101.09
(f) Mobile Portland Cement Concrete Plants .....	1103.04

**1020.04 Concrete Classes and General Mix Design Criteria.** The classes of concrete shown in Table 1 identify the various mixtures by the general uses and mix design criteria. If the class of concrete for a specific item of construction is not specified, Class SI concrete shall be used.

For the minimum cement factor in Table 1, it shall apply to portland cement, portland-pozzolan cement, and portland blast-furnace slag except when a particular cement is specified in the Table.

The Contractor shall not assume that the minimum cement factor indicated in Table 1 will produce a mixture that will meet the specified strength. In addition, the Contractor shall not assume that the maximum finely divided mineral allowed in a mix design according to Article 1020.05(c) will produce a mixture that will meet the specified strength. The Contractor shall select a cement factor within the allowable range that will obtain the specified strength. The Contractor shall take into consideration materials selected, seasonal temperatures, and other factors which may require the Contractor to submit multiple mix designs.

For a portland-pozzolan cement, portland blast-furnace slag cement, or when replacing portland cement with finely divided minerals per Articles 1020.05(c) and 1020.05(d), the portland cement content in the mixture shall be a minimum of 375 lbs/cu yd (222 kg/cu m). When the total of organic processing additions, inorganic processing additions, and limestone exceed 5.0 percent in the cement, the minimum portland cement content in the mixture shall be 400 lbs/cu yd (237 kg/cu m). When calculating the portland cement portion in the portland-pozzolan or portland blast-furnace slag cement, the AASHTO M 240 tolerance may be ignored.

Special classifications may be made for the purpose of including the concrete for a particular use or location as a separate pay item in the contract. The concrete used in such cases shall conform to this section.



FAI 90/94/290(I-90/94/290)  
 Project ACNHPP-0005(947)  
 Section 2013-008R  
 Cook County  
 Contract 60W26

TABLE 1. CLASSES OF CONCRETE AND MIX DESIGN CRITERIA											
Class of Conc.	Use	Specification Section Reference	Cement Factor		Water / Cement Ratio lb/lb	S l u m p  in. (4)	Mix Design Compressive Strength (Flexural Strength) psi, minimum			Air Content %	Coarse Aggregate Gradations (14)
			Min.	Max			Days				
							3	14	28		
PV	Pavement Base Course	420 or 421 353	5.65 (1) 6.05 (2)	7.05	0.32 - 0.42	2 - 4 (5)	Ty III 3500 (650)	3500 (650)		5.0 - 8.0 (5)	CA 5 & CA 7, CA 5 & CA 11, CA 7, CA 11, or CA 14
	Base Course Widening	354									
	Driveway Pavement	423									
	Shoulders	483									
	Shoulder Curb	662									
PP	Pavement Patching Bridge Deck Patching (10)	442					3200 (600) Article 701.17(e)(3)b.				CA 7, CA 11, CA 13, CA 14, or CA 16
	PP-1		6.50 6.20 (Ty III)	7.50 7.20 (Ty III)	0.32 - 0.44	2 - 4	at 48 hours			4.0 - 7.0	
	PP-2		7.35	8.20	0.32 - 0.38	2 - 6	at 24 hours			4.0 - 6.0	
	PP-3		7.35 (Ty III) (8)	7.35 (Ty III) (8)	0.32 - 0.35	2 - 4	at 16 hours			4.0 - 6.0	
	PP-4		6.00 (9)	6.25 (9)	0.32 - 0.50	2 - 6	at 8 hours			4.0 - 6.0	
	PP-5		6.75 (9)	6.75 (9)	0.32 - 0.40	2 - 8	at 4 hours			4.0 - 6.0	
RR	Railroad Crossing	422	6.50 6.20 (Ty III)	7.50 7.20 (Ty III)	0.32 - 0.44	2 - 4	3500 (650) at 48 hours			4.0 - 7.0	CA 7, CA 11, or CA 14
BS	Bridge Superstructure Bridge Approach Slab	503	6.05	7.05	0.32 - 0.44	2 - 4 (5)		4000 (675)		5.0 - 8.0 (5)	CA 7, CA 11, or CA 14 (7)
PC	Various Precast Concrete Items Wet Cast Dry Cast	1042	5.65 5.65 (TY III)	7.05 7.05 (TY III)	0.32 - 0.44 0.25 - 0.40	1 - 4 0 - 1	See Section 1042			5.0 - 8.0 N/A	CA7, CA11,CA 13, CA 14, CA 16, or CA 7 & CA 16
PS	Precast Prestressed Members	504	5.65 5.65 (TY III)	7.05 7.05 (TY III)	0.32 - 0.44	1 - 4			Plans	5.0 - 8.0	CA 11 (11), CA 13, CA 14 (11), or CA 16
	Precast Prestressed Piles and Extensions	512							5000		
	Precast Prestressed Sight Screen	639							3500		

TABLE 1. CLASSES OF CONCRETE AND MIX DESIGN CRITERIA												
Class of Conc.	Use	Specification Section Reference	Cement Factor		Water / Cement Ratio lb/lb	Slump in. (4)	Mix Design Compressive Strength (Flexural Strength) psi, minimum			Air Content %	Coarse Aggregate Gradations (14)	
			cwt/cu yd (3)	Min.			Max	Days				
								3	14			28
DS	Drilled Shaft (12) Metal Shell Piles (12) Sign Structures Drilled Shaft (12) Light Tower Foundation (12)	516 512 734 837	6.65	7.05	0.32 - 0.44	6 - 8 (6)		4000 (675)		5.0 - 8.0	CA 13, CA 14, CA 16, or a blend of these gradations.	
SC	Seal Coat	503	5.65 (1) 6.05 (2)	7.05	0.32 - 0.44	3 - 5		3500 (650)		Optional 6.0 max.	CA 3 & CA 7, CA 3 & CA 11, CA 5 & CA 7, CA 5 & CA 11, CA 7, or CA 11	
SI	Structures (except Superstructure) Sidewalk Slope Wall Encasement Box Culverts End Section and Collar Curb, Gutter, Curb & Gutter, Median, and Paved Ditch Concrete Barrier Sign Structures Spread Footing Concrete Foundation Pole Foundation (12) Traffic Signal Foundation Drilled Shaft (12) Square or Rectangular	503 424 511 512 540 542 606 637 734 836 878	5.65 (1) 6.05 (2)	7.05	0.32 - 0.44	2 - 4 (5)		3500 (650)		5.0 - 8.0 (5)	CA 3 & CA 7, CA 3 & CA 11, CA 5 & CA 7, CA 5 & CA 11, CA 7, CA 11, CA 13, CA 14, or CA 16 (13)	

- Notes:
- (1) Central-mixed.
  - (2) Truck-mixed or shrink-mixed.
  - (3) For Class SC concrete and for any other class of concrete that is to be placed underwater, except Class DS concrete, the cement factor shall be increased by ten percent.
  - (4) The maximum slump may be increased to 7 in. when a high range water-reducing admixture is used for all classes of concrete, except Class PV, SC, and PP. For Class SC, the maximum slump may be increased to 8 in. For Class PP-1, the maximum slump may be increased to 6 in. For Class PS, the 7 in. maximum slump may be increased to 8 1/2 in. if the high range water-reducing admixture is the polycarboxylate type.
  - (5) The slump range for slipform construction shall be 1/2 to 2 1/2 in. and the air content range shall be 5.5 to 8.0 percent.
  - (6) If concrete is placed to displace drilling fluid, or against temporary casing, the slump shall be 8 - 10 in. at the point of placement. If a water-reducing admixture is used in lieu of a high range water-reducing admixture according to Article 1020.05(b)(7), the slump shall be 2 - 4 in.
  - (7) For Class BS concrete used in bridge deck patching, the coarse aggregate gradation shall be CA 13, CA 14, or CA 16, except CA 11 may be used for full-depth patching.
  - (8) In addition to the Type III portland cement, 100 lb/cu yd of ground granulated blast-furnace slag and 50 lb/cu yd of microsilica (silica fume) shall be used. For an air temperature greater than 85 °F, the Type III portland cement may be replaced with Type I or II portland cement.
  - (9) The cement shall be a rapid hardening cement from the Department's "Approved List of Packaged, Dry, Rapid Hardening Cementitious Materials for Concrete Repairs" for PP-4 and calcium aluminate cement for PP-5.
  - (10) For Class PP concrete used in bridge deck patching, the coarse aggregate gradation shall be CA 13, CA 14, or CA 16, except CA 11 may be used for full-depth patching. In addition, the mix design shall have 72 hours to obtain a 4,000 psi compressive or 675 psi flexural strength for all PP mix designs.
  - (11) The nominal maximum size permitted is 3/4 in. Nominal maximum size is defined as the largest sieve which retains any of the aggregate sample particles.
  - (12) The concrete mix shall be designed to remain fluid throughout the anticipated duration of the pour plus one hour. At the Engineer's discretion, the Contractor may be required to conduct a minimum 2 cu yd trial batch to verify the mix design.
  - (13) CA 3 or CA 5 may be used when the nominal maximum size does not exceed two-thirds the clear distance between parallel reinforcement bars, or between the reinforcement bar and the form. Nominal maximum size is defined in Note 11.
  - (14) Alternate combinations of gradation sizes may be used with the approval of the Engineer. Refer also to Article 1004.02(d) for additional information on combining sizes.

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 Project ACNHPP-0005(947)  
 Section 2013-008R  
 Cook County  
 Contract 60W26

TABLE 1. CLASSES OF CONCRETE AND MIX DESIGN CRITERIA (metric)											
Class of Conc.	Use	Specification Section Reference	Cement Factor		Water / Cement Ratio kg/kg	S l u m p  mm (4)	Mix Design Compressive Strength (Flexural Strength) kPa, minimum			Air Content %	Coarse Aggregate Gradations (14)
			kg/cu m (3)				Days				
			Min.	Max			3	14	28		
PV	Pavement Base Course	420 or 421 353			0.32 - 0.42	50 - 100 (5)	Ty III 24,000 (4500)	24,000 (4500)		5.0 - 8.0 (5)	CA 5 & CA 7, CA 5 & CA 11, CA 7, CA 11, or CA 14
	Base Course Widening	354	335 (1)	418							
	Driveway Pavement	423	360 (2)								
	Shoulders	483									
	Shoulder Curb	662									
PP	Pavement Patching Bridge Deck Patching (10)	442					22,100 (4150) Article 701.17(e)(3)b.				CA 7, CA 11, CA 13, CA 14, or CA 16
	PP-1		385 365 (Ty III)	445 425 (Ty III)	0.32 - 0.44	50 - 100	at 48 hours	4.0 - 7.0			
	PP-2		435	485	0.32 - 0.38	50 - 150	at 24 hours	4.0 - 6.0			
	PP-3		435 (Ty III) (8)	435 (Ty III) (8)	0.32 - 0.35	50 - 100	at 16 hours	4.0 - 6.0			
	PP-4		355 (9)	370 (9)	0.32 - 0.50	50 - 150	at 8 hours	4.0 - 6.0			
	PP-5		400 (9)	400 (9)	0.32 - 0.40	50 - 200	at 4 hours	4.0 - 6.0			
RR	Railroad Crossing	422	385 365 (Ty III)	445 425 (Ty III)	0.32 - 0.44	50 - 100	24,000 (4500) at 48 hours		4.0 - 7.0	CA 7, CA 11, or CA 14	
BS	Bridge Superstructure Bridge Approach Slab	503	360	418	0.32 - 0.44	50 - 100 (5)	27,500 (4650)		5.0 - 8.0 (5)	CA 7, CA 11, or CA 14 (7)	
PC	Various Precast Concrete Items Wet Cast Dry Cast	1042	335 335 (TY III)	418 418 (TY III)	0.32 - 0.44 0.25 - 0.40	25 - 100 0 - 25	See Section 1042		5.0 - 8.0 N/A	CA7, CA11, CA13, CA 14, CA 16, or CA 7 & CA 16	
PS	Precast Prestressed Members	504						Plans	5.0 - 8.0	CA 11 (11), CA 13, CA 14 (11), or CA 16	
	Precast Prestressed Piles and Extensions	512	335 335 (TY III)	418 418 (TY III)	0.32 - 0.44	25 - 100		34,500			
	Precast Prestressed Sight Screen	639						24,000			

TABLE 1. CLASSES OF CONCRETE AND MIX DESIGN CRITERIA (metric)											
Class of Conc.	Use	Specification Section Reference	Cement Factor		Water / Cement Ratio kg/kg	S l u m p  mm (4)	Mix Design Compressive Strength (Flexural Strength)			Air Content %	Coarse Aggregate Gradations (14)
			kg/cu m (3)				kPa, minimum				
			Min.	Max			Days				
						3	14	28			
DS	Drilled Shaft (12) Metal Shell Piles (12) Sign Structures Drilled Shaft (12) Light Tower Foundation (12)	516 512 734 837	395	418	0.32 - 0.44	150 - 200 (6)		27,500 (4650)		5.0 - 8.0	CA 13, CA 14, CA 16, or a blend of these gradations.
SC	Seal Coat	503	335 (1) 360 (2)	418	0.32 - 0.44	75 - 125		24,000 (4500)	Optional 6.0 max.	CA 3 & CA 7, CA 3 & CA 11, CA 5 & CA 7, CA 5 & CA 11, CA 7, or CA 11	
SI	Structures (except Superstructure) Sidewalk Slope Wall Encasement Box Culverts End Section and Collar Curb, Gutter, Curb & Gutter, Median, and Paved Ditch Concrete Barrier Sign Structures Spread Footing Concrete Foundation Pole Foundation (12) Traffic Signal Foundation Drilled Shaft (12) Square or Rectangular	503 424 511 512 540 542 606 637 734 836 878	335 (1) 360 (2)	418	0.32 - 0.44	50 - 100 (5)		24,000 (4500)	5.0 - 8.0 (5)	CA 3 & CA 7, CA 3 & CA 11, CA 5 & CA 7, CA 5 & CA 11, CA 7, CA 11, CA 13, CA 14, or CA 16 (13)	

- Notes:
- (1) Central-mixed.
  - (2) Truck-mixed or shrink-mixed.
  - (3) For Class SC concrete and for any other class of concrete that is to be placed underwater, except Class DS concrete, the cement factor shall be increased by ten percent.
  - (4) The maximum slump may be increased to 175 mm when a high range water-reducing admixture is used for all classes of concrete except Class PV, SC, and PP. For Class SC, the maximum slump may be increased to 200 mm. For Class PP-1, the maximum slump may be increased to 150 mm. For Class PS, the 175 mm maximum slump may be increased to 215 mm if the high range water-reducing admixture is the polycarboxylate type.
  - (5) The slump range for slipform construction shall be 13 to 64 mm and the air content range shall be 5.5 to 8.0 percent.
  - (6) If concrete is placed to displace drilling fluid, or against temporary casing, the slump shall be 200 - 250 mm at the point of placement. If a water-reducing admixture is used in lieu of a high range water-reducing admixture according to Article 1020.05(b)(7), the slump shall be 50 – 100 mm.
  - (7) For Class BS concrete used in bridge deck patching, the coarse aggregate gradation shall be CA 13, CA 14, or CA 16, except CA 11 may be used for full-depth patching.
  - (8) In addition to the Type III portland cement, 60 kg/cu m of ground granulated blast-furnace slag and 30 kg/cu m of microsilica (silica fume) shall be used. For an air temperature greater than 30 °C, the Type III portland cement may be replaced with Type I or II portland cement.
  - (9) The cement shall be a rapid hardening cement from the Department's "Approved List of Packaged, Dry, Rapid Hardening Cementitious Materials for Concrete Repairs" for PP-4 and calcium aluminate cement for PP-5.
  - (10) For Class PP concrete used in bridge deck patching, the coarse aggregate gradation shall be CA 13, CA 14, or CA 16, except CA 11 may be used for full-depth patching. In addition, the mix design shall have 72 hours to obtain a 27,500 kPa compressive or 4,650 kPa flexural.
  - (11) The nominal maximum size permitted is 19 mm. Nominal maximum size is defined as the largest sieve which retains any of the aggregate sample particles.
  - (12) The concrete mix shall be designed to remain fluid throughout the anticipated duration of the pour plus one hour. At the Engineer's discretion, the Contractor may be required to conduct a minimum 1.5 cu m trial batch to verify the mix design.
  - (13) CA 3 or CA 5 may be used when the nominal maximum size does not exceed two-thirds the clear distance between parallel reinforcement bars, or between the reinforcement bar and the form. Nominal maximum size is defined in Note 11.
  - (14) Alternate combinations of gradation sizes may be used with the approval of the Engineer. Refer also to Article 1004.02(d) for additional information on combining sizes.

Self-consolidating concrete is a flowable mixture that does not require mechanical vibration for consolidation. Self-consolidating concrete mix designs may be developed for Class BS, PC, PS, DS, and SI concrete. Self-consolidating concrete mix designs may also be developed for precast concrete products that are not subjected to Class PC concrete requirements according to Section 1042. The mix design criteria for the concrete mixture shall be according to Article 1020.04 with the following exceptions.

- (a) The slump requirements shall not apply.
- (b) The concrete mixture should be uniformly graded, and information in the "Portland Cement Concrete Level III Technician Course – Manual of Instructions for Design of Concrete Mixtures" may be used to develop the uniformly graded mix design. The coarse aggregate gradations shall be CA 11, CA 13, CA 14, CA 16, or a blend of these gradations. However, the final gradation when using a single coarse aggregate or combination of coarse aggregates shall have 100 percent pass the 1 in. (25 mm) sieve, and minimum 95 percent pass the 3/4 in. (19 mm) sieve. The fine aggregate proportion shall be a maximum 50 percent by weight (mass) of the total aggregate used.
- (c) The slump flow range shall be 22 in. (560 mm) minimum to 28 in. (710 mm) maximum and tested according to Illinois Test Procedure SCC-2.
- (d) The visual stability index shall be a maximum of 1 and tested according to Illinois Test Procedure SCC-2.
- (e) The J-Ring value shall be a maximum of 2 in. (50 mm) and tested according to Illinois Test Procedure SCC-3. The L-Box blocking ratio shall be a minimum of 80 percent and tested according to Illinois Test Procedure SCC-3. The Contractor has the option to select either test.
- (f) The hardened visual stability index shall be a maximum of 1 and tested according to Illinois Test Procedure SCC-6.
- (g) If Class PC concrete requirements do not apply to the precast concrete product according to Section 1042, the maximum cement factor shall be 7.05 cwt/cu yd (418 kg/cu m) and the maximum allowable water/cement ratio shall be 0.44.
- (h) If the measured slump flow, visual stability index, J-Ring value, or L-Box blocking ratio fall outside the limits specified, a check test will be made. In the event of a second failure, the Engineer may refuse to permit the use of the batch of concrete represented.

The Contractor may use water or self-consolidating admixtures at the jobsite to obtain the specified slump flow, visual stability index, J-ring value, or L-box blocking ratio. The maximum design water/cement ratio shall not be exceeded.

**1020.05 Other Concrete Criteria.** The concrete shall be according to the following.

- (a) **Proportioning and Mix Design.** For all Classes of concrete, it shall be the Contractor's responsibility to determine mix design material proportions and to proportion each batch of concrete. A Level III PCC Technician shall develop the mix design for all Classes of concrete, except Classes PC and PS. The mix design, submittal information, trial batch, and Engineer verification shall be according to the "Portland Cement Concrete Level III Technician" course material.

The Contractor shall provide the mix designs a minimum of 45 calendar days prior to production. More than one mix design may be submitted for each class of concrete.

The Engineer will verify the mix design submitted by the Contractor. Verification of a mix design shall in no manner be construed as acceptance of any mixture produced. Once a mix design has been verified, the Engineer shall be notified of any proposed changes.

Tests performed at the jobsite will determine if a mix design can meet specifications. If the tests indicate it cannot, the Contractor shall make adjustments to a mix design, or submit a new mix design if necessary, to comply with the specifications.

- (b) Admixtures. The Contractor shall be responsible for using admixtures and determining dosages for all Classes of concrete, cement aggregate mixture II, and controlled low-strength material that will produce a mixture with suitable workability, consistency, and plasticity. In addition, admixture dosages shall result in the mixture meeting the specified plastic and hardened properties. The Contractor shall obtain approval from the Engineer to use an accelerator when the concrete temperature is greater than 60 °F (16 °C). However, this accelerator approval by the Engineer will not be required for Class PP, RR, PC, and PS concrete. The accelerator shall be the non-chloride type unless otherwise specified in the contract plans.

The Department will maintain an Approved List of Corrosion Inhibitors. Corrosion inhibitor dosage rates shall be according to Article 1020.05(b)(10). For information on approved controlled low-strength material air-entraining admixtures, refer to Article 1019.02. The Department will also maintain an Approved List of Concrete Admixtures, and an admixture technical representative shall be consulted by the Contractor prior to the pour when determining an admixture dosage from this list or when making minor admixture dosage adjustments at the jobsite. The dosage shall be within the range indicated on the approved list unless the influence by other admixtures, jobsite conditions (such as a very short haul time), or other circumstances warrant a dosage outside the range. The Engineer shall be notified when a dosage is proposed outside the range. To determine an admixture dosage, air temperature, concrete temperature, cement source and quantity, finely divided mineral sources and quantity, influence of other admixtures, haul time, placement conditions, and other factors as appropriate shall be considered. The Engineer may request the Contractor to have a batch of concrete mixed in the lab or field to verify the admixture dosage is correct. An admixture dosage or combination of admixture dosages shall not delay the initial set of concrete by more than one hour. When a retarding admixture is required or appropriate for a bridge deck or bridge deck overlay pour, the initial set time shall be delayed until the deflections due to the concrete dead load are no longer a concern for inducing cracks in the completed work. However, a retarding admixture shall not be used to further extend the pour time and justify the alteration of a bridge deck pour sequence.

When determining water in admixtures for water/cement ratio, the Contractor shall calculate 70 percent of the admixture dosage as water, except a value of 50 percent shall be used for a latex admixture used in bridge deck latex concrete overlays.



The sequence, method, and equipment for adding the admixtures shall be approved by the Engineer. Admixtures shall be added to the concrete separately. An accelerator shall always be added prior to a high range water-reducing admixture, if both are used.

Admixture use shall be according to the following.

- (1) When the atmosphere or concrete temperature is 65 °F (18 °C) or higher, a retarding admixture shall be used in the Class BS concrete and concrete bridge deck overlays. The proportions of the ingredients of the concrete shall be the same as without the retarding admixture, except that the amount of mixing water shall be reduced, as may be necessary, in order to maintain the consistency of the concrete as required. In addition, a high range water-reducing admixture shall be used in bridge deck concrete. At the option of the Contractor, a water-reducing admixture may be used with the high range water-reducing admixture in Class BS concrete.
- (2) At the Contractor's option, admixtures in addition to an air-entraining admixture may be used for Class PP-1 or RR concrete. When the air temperature is less than 55 °F (13 °C) and an accelerator is used, the non-chloride accelerator shall be calcium nitrite.
- (3) When Class C fly ash or ground granulated blast-furnace slag is used in Class PP-1 or RR concrete, a water-reducing or high range water-reducing admixture shall be used.
- (4) For Class PP-2 or PP-3 concrete, a non-chloride accelerator followed by a high range water-reducing admixture shall be used, in addition to the air-entraining admixture. The Contractor has the option to use a water-reducing admixture with the high range water-reducing admixture. For Class PP-3 concrete, the non-chloride accelerator shall be calcium nitrite. For Class PP-2 concrete, the non-chloride accelerator shall be calcium nitrite when the air temperature is less than 55 °F (13 °C).
- (5) For Class PP-4 concrete, a high range water-reducing admixture shall be used in addition to the air-entraining admixture. The Contractor has the option to use a water-reducing admixture with the high range water-reducing admixture. An accelerator shall not be used. For stationary or truck-mixed concrete, a retarding admixture shall be used to allow for haul time. The Contractor has the option to use a mobile portland cement concrete plant, but a retarding admixture shall not be used unless approved by the Engineer.

For PP-5 concrete, a non-chloride accelerator, high range water-reducing admixture, and air-entraining admixture shall be used. The accelerator, high range water-reducing admixture, and air-entraining admixture shall be per the Contractor's recommendation and dosage. The approved list of concrete admixtures shall not apply. A mobile portland cement concrete plant shall be used to produce the patching mixture.

- (6) When a calcium chloride accelerator is specified in the contract, the maximum chloride dosage shall be 1.0 quart (1.0 L) of solution per 100 lb (45 kg) of cement. The dosage may be increased to a maximum 2.0 quarts (2.0 L) per 100 lb (45 kg) of cement if approved by the Engineer. When a calcium chloride accelerator for Class PP-2 concrete is specified in the contract, the maximum chloride dosage shall be 1.3 quarts (1.3 L) of solution per 100 lb (45 kg) of cement. The dosage may be increased to a maximum 2.6 quarts (2.6 L) per 100 lb (45 kg) of cement if approved by the Engineer.
- (7) For Class DS concrete a retarding admixture and a high range water-reducing admixture shall be used. For dry excavations that are 10 ft (3 m) or less, the high range water-reducing admixture may be replaced with a water-reducing admixture if the concrete is vibrated. The use of admixtures shall take into consideration the slump loss limits specified in Article 516.12 and the fluidity requirement in Article 1020.04 (Note 12).
- (8) At the Contractor's option, when a water-reducing admixture or a high range water-reducing admixture is used for Class PV, PP-1, RR, SC, and SI concrete, the cement factor may be reduced a maximum 0.30 hundredweight/cu yd (18 kg/cu m). However, a cement factor reduction will not be allowed for concrete placed underwater.
- (9) When Type F or Type G high range water-reducing admixtures are used, the initial slump shall be a minimum of 1 1/2 in. (40 mm) prior to addition of the Type F or Type G admixture, except as approved by the Engineer.
- (10) When specified, a corrosion inhibitor shall be added to the concrete mixture utilized in the manufacture of precast, prestressed concrete members and/or other applications. It shall be added, at the same rate, to all grout around post-tensioning steel when specified.

When calcium nitrite is used, it shall be added at the rate of 4 gal/cu yd (20 L/cu m), and shall be added to the mix immediately after all compatible admixtures have been introduced to the batch.

When Rheocrete 222+ is used, it shall be added at the rate of 1.0 gal/cu yd (5.0 L/cu m), and the batching sequence shall be according to the manufacturer's instructions.

- (c) Finely Divided Minerals. Use of finely divided minerals shall be according to the following.
  - (1) Fly Ash. At the Contractor's option, fly ash from approved sources may partially replace portland cement in cement aggregate mixture II, Class PV, PP-1, PP-2, RR, BS, PC, PS, DS, SC, and SI concrete.

The use of fly ash shall be according to the following.

- a. Measurements of fly ash and portland cement shall be rounded up to the nearest 5 lb (2.5 kg).
  - b. When Class F fly ash is used in cement aggregate mixture II, Class PV, BS, PC, PS, DS, SC, and SI concrete, the amount of portland cement replaced shall not exceed 25 percent by weight (mass).
  - c. When Class C fly ash is used in cement aggregate mixture II, Class PV, PP-1, PP-2, RR, BS, PC, PS, DS, SC, and SI concrete, the amount of portland cement replaced shall not exceed 30 percent by weight (mass).
  - d. Fly ash may be used in concrete mixtures when the air temperature is below 40 °F (4 °C), but the Engineer may request a trial batch of the concrete mixture to show the mix design strength requirement will be met.
- (2) Ground Granulated Blast-Furnace (GGBF) Slag. At the Contractor's option, GGBF slag may partially replace portland cement in Class PV, PP-1, PP-2, RR, BS, PC, PS, DS, SC, and SI concrete. For Class PP-3 concrete, GGBF slag shall be used according to Article 1020.04.

The use of GGBF slag shall be according to the following.

- a. Measurements of GGBF slag and portland cement shall be rounded up to the nearest 5 lb (2.5 kg).
  - b. When GGBF slag is used in Class PV, PP-1, PP-2, RR, BS, PC, PS, DS, SC and SI concrete, the amount of portland cement replaced shall not exceed 35 percent by weight (mass).
  - c. GGBF slag may be used in concrete mixtures when the air temperature is below 40 °F (4 °C), but the Engineer may request a trial batch of the concrete mixture to show the mix design strength requirement will be met.
- (3) Microsilica. At the Contractor's option, microsilica may be added at a maximum of 5.0 percent by weight (mass) of the cement and finely divided minerals summed together.

Microsilica shall be used in Class PP-3 concrete according to Article 1020.04.

- (4) High Reactivity Metakaolin (HRM). At the Contractor's option, HRM may be added at a maximum of 5.0 percent by weight (mass) of the cement and finely divided minerals summed together.

(5) Mixtures with Multiple Finely Divided Minerals. Except as specified for Class PP-3 concrete, the Contractor has the option to use more than one finely divided mineral in Class PV, PP-1, PP-2, RR, BS, PC, PS, DS, SC, and SI concrete as follows.

- a. The mixture shall contain a maximum of two finely divided minerals. The finely divided mineral in portland-pozzolan cement or portland blast-furnace slag cement shall count toward the total number of finely divided minerals allowed. The finely divided minerals shall constitute a maximum of 35.0 percent of the total cement plus finely divided minerals. The fly ash portion shall not exceed 30.0 percent for Class C fly ash or 25.0 percent for Class F fly ash. The Class C and F fly ash combination shall not exceed 30.0 percent. The ground granulated blast-furnace slag portion shall not exceed 35.0 percent. The microsilica or high-reactivity metakaolin portion used together or separately shall not exceed ten percent. The finely divided mineral in the portland-pozzolan cement or portland blast-furnace slag blended cement shall apply to the maximum 35.0 percent.
- b. Central Mixed. For Class PV, SC, and SI concrete, the mixture shall contain a minimum of 565 lbs/cu yd (335 kg/cu m) of cement and finely divided minerals summed together. If a water-reducing or high-range water-reducing admixture is used, the Contractor has the option to use a minimum of 535 lbs/cu yd (320 kg/cu m).
- c. Truck-Mixed or Shrink-Mixed. For Class PV, SC, and SI concrete, the mixture shall contain a minimum of 605 lbs/cu yd (360 kg/cu m) of cement and finely divided minerals summed together. If a water-reducing or high-range water-reducing admixture is used, the Contractor has the option to use a minimum of 575 lbs/cu yd (345 kg/cu m).
- d. Central-Mixed, Truck-Mixed or Shrink-Mixed. For Class PP-1 and RR concrete, the mixture shall contain a minimum of 650 lbs/cu yd (385 kg/cu m) of cement and finely divided minerals summed together. For Class PP-1 and RR concrete using Type III portland cement, the mixture shall contain a minimum of 620 lbs/cu yd (365 kg/cu m).

For Class PP-2 concrete, the mixture shall contain a minimum of 735 lbs/cu yd (435 kg/cu m) of cement and finely divided minerals summed together. For Class BS concrete, the mixture shall contain a minimum of 605 lbs/cu yd (360 kg/cu m). For Class DS concrete, the mixture shall contain a minimum of 665 lbs/cu yd (395 kg/cu m).

If a water-reducing or high range water-reducing admixture is used in Class PP-1 and RR concrete, the Contractor has the option to use a minimum of 620 lbs/cu yd (365 kg/cu m) of cement and finely divided minerals summed together. If a water-reducing or high-range water-reducing admixture is used with Type III portland cement in Class PP-1 and RR concrete, the Contractor has the option to use a minimum of 590 lbs/cu yd (350 kg/cu m).

- e. Central-Mixed or Truck-Mixed. For Class PC and PS concrete, the mixture shall contain a minimum of 565 lbs/cu yd (335 kg/cu m) of cement and finely divided minerals summed together.
  - f. The mixture shall contain a maximum of 705 lbs/cu yd (418 kg/cu m) of cement and finely divided mineral(s) summed together for Class PV, BS, PC, PS, DS, SC, and SI concrete. For Class PP-1 and RR concrete, the mixture shall contain a maximum of 750 lbs/cu yd (445 kg/cu m). For Class PP-1 and RR concrete using Type III portland cement, the mixture shall contain a maximum of 720 lbs/cu yd (425 kg/cu m). For Class PP-2 concrete, the mixture shall contain a maximum of 820 lbs/cu yd (485 kg/cu m).
  - g. For Class SC concrete and for any other class of concrete that is to be placed underwater, except Class DS concrete, the allowable cement and finely divided minerals summed together shall be increased by ten percent.
  - h. The combination of cement and finely divided minerals shall comply with Article 1020.05(d).
- (d) Alkali-Silica Reaction. For cast-in-place (includes cement aggregate mixture II and latex mixtures), precast, and precast prestressed concrete, one of the mixture options provided in Article 1020.05(d)(2) shall be used to reduce the risk of a deleterious alkali-silica reaction in concrete exposed to humid or wet conditions. The mixture options are not intended or adequate for concrete exposed to potassium acetate, potassium formate, sodium acetate, or sodium formate. The mixture options will not be required for the dry environment (humidity less than 60 percent) found inside buildings for residential or commercial occupancy.

The mixture options shall not apply to concrete revetment mats, insertion lining of pipe culverts, portland cement mortar fairing course, controlled low-strength material, miscellaneous grouts that are not prepackaged, Class PP-3 concrete, Class PP-4 concrete, and Class PP-5 concrete.

- (1) Aggregate Groups. Each combination of aggregates used in a mixture will be assigned to an aggregate group. The point at which the coarse aggregate and fine aggregate expansion values intersect in the following table will determine the group.

Aggregate Groups			
Coarse Aggregate or Coarse Aggregate Blend  ASTM C 1260 Expansion	Fine Aggregate Or Fine Aggregate Blend  ASTM C 1260 Expansion		
	≤0.16%	>0.16% - 0.27%	>0.27%
≤0.16%	Group I	Group II	Group III
>0.16% - 0.27%	Group II	Group II	Group III
>0.27%	Group III	Group III	Group IV

(2) Mixture Options. Based upon the aggregate group, the following mixture options shall be used. However, the Department may prohibit a mixture option if field performance shows a deleterious alkali-silica reaction or Department testing indicates the mixture may experience a deleterious alkali-silica reaction.

Reduction of Risk for Deleterious Alkali-Silica Reaction					
Aggregate Groups	Mixture Options				
	Option 1	Option 2	Option 3	Option 4	Option 5
Group I	Mixture options are not applicable. Use any cement or finely divided mineral.				
Group II	X	X	X	X	X
Group III	X	Combine Option 2 with Option 3	Combine Option 2 with Option 3	X	X
Group IV	X	Combine Option 2 with Option 4	Invalid Option	Combine Option 2 with Option 4	X

“X” denotes valid mixture option for aggregate group.

- a. Mixture Option 1. The coarse or fine aggregates shall be blended to place the material in a group that will allow the selected cement or finely divided mineral to be used. Coarse aggregate may only be blended with another coarse aggregate. Fine aggregate may only be blended with another fine aggregate. Blending of coarse with fine aggregate to place the material in another group will not be permitted.

When a coarse or fine aggregate is blended, the weighted expansion value shall be calculated separately for the coarse and fine aggregate as follows:

$$\text{Weighted Expansion Value} = (a/100 \times A) + (b/100 \times B) + (c/100 \times C) + \dots$$

Where: a, b, c... = percentage of aggregate in the blend;  
A, B, C... = expansion value for that aggregate.

- b. Mixture Option 2. A finely divided mineral shall be used as described in 1), 2), 3), or 4) that follow. In addition, a blended cement with a finely divided mineral may be added to a separate finely divided mineral to meet the following requirements, provided the finely divided minerals are the same material. However, adding together two different finely divided minerals to obtain the specified minimum percentage of one material will not be permitted for 1), 2), 3), and 4). Refer to Mixture Option 5 to address this situation.

1. Class F Fly Ash. For cement aggregate mixture II, Class PV, BS, PC, PS, MS, DS, SC and SI concrete, the Class F fly ash shall be a minimum 25.0 percent by weight (mass) of the cement and finely divided minerals summed together.

If the maximum total equivalent available alkali content ( $\text{Na}_2\text{O} + 0.658\text{K}_2\text{O}$ ) exceeds 4.50 percent for the Class F fly ash, it may be used only if it complies with Mixture Option 5.

2. Class C Fly Ash. For cement aggregate mixture II, Class PV, PP-1, PP-2, RR, BS, PC, PS, DS, SC, and SI concrete, Class C fly ash shall be a minimum of 25.0 percent by weight (mass) of the cement and finely divided minerals summed together.

If the maximum total equivalent available alkali content ( $\text{Na}_2\text{O} + 0.658\text{K}_2\text{O}$ ) exceeds 4.50 percent or the calcium oxide exceeds 26.50 percent for the Class C fly ash, it may be used only per Mixture Option 5.

3. Ground Granulated Blast-Furnace Slag. For Class PV, PP-1, PP-2, RR, BS, PC, PS, DS, SC, and SI concrete, ground granulated blast-furnace slag shall be a minimum of 25.0 percent by weight (mass) of the cement and finely divided minerals summed together.

If the maximum total equivalent available alkali content ( $\text{Na}_2\text{O} + 0.658\text{K}_2\text{O}$ ) exceeds 1.00 percent for the ground granulated blast-furnace slag, it may be used only per Mixture Option 5.

4. Microsilica or High Reactivity Metakaolin, Microsilica solids or high reactivity metakaolin shall be a minimum 5.0 percent by weight (mass) of the cement and finely divided minerals summed together.

If the maximum total equivalent available alkali content ( $\text{Na}_2\text{O} + 0.658\text{K}_2\text{O}$ ) exceeds 1.00 percent for the Microsilica or High Reactivity Metakaolin, it may be used only if it complies with Mixture Option 5.

- c. Mixture Option 3. The cement used shall have a maximum total equivalent alkali content ( $\text{Na}_2\text{O} + 0.658\text{K}_2\text{O}$ ) of 0.60 percent. When aggregate in Group II is involved and the Contractor desires to use a finely divided mineral, any finely divided mineral may be used with the cement unless the maximum total equivalent available alkali content ( $\text{Na}_2\text{O} + 0.658\text{K}_2\text{O}$ ) exceeds 4.50 percent for the fly ash; or 1.00 percent for the ground granulated blast-furnace slag, microsilica or high reactivity metakaolin. If the alkali content is exceeded, the finely divided mineral may be used only per Mixture Option 5.
- d. Mixture Option 4. The cement used shall have a maximum total equivalent alkali content ( $\text{Na}_2\text{O} + 0.658\text{K}_2\text{O}$ ) of 0.45 percent. When aggregate in Group II or III is involved and the Contractor desires to use a finely divided mineral, any finely divided mineral may be used with the cement unless the maximum total equivalent available alkali content ( $\text{Na}_2\text{O} + 0.658\text{K}_2\text{O}$ ) exceeds 4.50 percent for the fly ash; or 1.00 percent for the ground granulated blast-furnace slag, microsilica, or high reactivity metakaolin. If the alkali content is exceeded, the finely divided mineral may be used only per Mixture Option 5.
- e. Mixture Option 5. The proposed cement or finely divided mineral may be used if the ASTM C 1567 expansion value is  $\leq 0.16$  percent when performed on the aggregate in the concrete mixture with the highest ASTM C 1260 test result. The laboratory performing the ASTM C 1567 test shall be approved by the Department according to the current Bureau of Materials and Physical Research Policy Memorandum "Minimum Laboratory Requirements for Alkali-Silica Reactivity (ASR) Testing". The ASTM C 1567 test will be valid for two years, unless the Engineer determines the materials have changed significantly.

For latex concrete, the ASTM C 1567 test shall be performed without the latex.

The 0.20 percent autoclave expansion limit in ASTM C 1567 shall not apply.

If during the two year time period the Contractor needs to replace the cement, and the replacement cement has an equal or lower total equivalent alkali content ( $\text{Na}_2\text{O} + 0.658\text{K}_2\text{O}$ ), a new ASTM C 1567 test will not be required.



The Engineer reserved the right to verify a Contractor's ASTM C 1567 test result. When the Contractor performs the test, a split sample may be requested by the Engineer. The Engineer may also independently obtain a sample at any time. The proposed cement or finely divided mineral will not be allowed for use if the Contractor or Engineer obtains an expansion value greater than 0.16 percent.

**1020.06 Water/Cement Ratio.** The water/cement ratio shall be determined on a weight (mass) basis. When a maximum water/cement ratio is specified, the water shall include mixing water, water in admixtures, free moisture on the aggregates, and water added at the jobsite. The quantity of water may be adjusted within the limit specified to meet slump requirements.

When fly ash, ground granulated blast-furnace slag, high-reactivity metakaolin, or microsilica (silica fume) are used in a concrete mix, the water/cement ratio will be based on the total cement and finely divided minerals contained in the mixture.

**1020.07 Slump.** The slump shall be determined according to Illinois Modified AASHTO T 119.

If the measured slump falls outside the limits specified, a check test will be made. In the event of a second failure, the Engineer may refuse to permit the use of the batch of concrete represented.

If the Contractor is unable to add water to prepare concrete of the specified slump without exceeding the maximum design water/cement ratio, a water-reducing admixture shall be added.

**1020.08 Air Content.** The air content shall be determined according to Illinois Modified AASHTO T 152 or Illinois Modified AASHTO T 196. The air-entrainment shall be obtained by the use of cement with an approved air-entraining admixture added during the mixing of the concrete or the use of air-entraining cement.

If the air-entraining cement furnished is found to produce concrete having air content outside the limits specified, its use shall be discontinued immediately and the Contractor shall provide other air-entraining cement which will produce air contents within the specified limits.

If the air content obtained is above the specified maximum limit at the jobsite, the Contractor may have the concrete further mixed, within the limits of time and revolutions specified, to reduce the air content. If the air content obtained is below the specified minimum limit, the Contractor may add to the concrete a sufficient quantity of an approved air-entraining admixture at the jobsite to bring the air content within the specified limits.

**1020.09 Strength Tests.** The specimens shall be molded and cured according to Illinois Modified AASHTO T 23. Specimens shall be field cured with the construction item as specified in Illinois Modified AASHTO T 23. The compressive strength shall be determined according to Illinois Modified AASHTO T 22. The flexural strength shall be determined according to Illinois Modified AASHTO T 177.

Except for Class PC and PS concrete, the Contractor shall transport the strength specimens from the site of the work to the field laboratory or other location as instructed by the Engineer. During transportation in a suitable light truck, the specimens shall be embedded in straw, burlap, or other acceptable material in a manner meeting with the approval of the Engineer to protect them from damage; care shall be taken to avoid impacts during hauling and handling. For strength specimens, the Contractor shall provide a field curing box for initial curing and a water storage tank for final curing. The field curing box will be required when an air temperature below 60 °F (16 °C) is expected during the initial curing period. The device shall maintain the initial curing temperature range specified in Illinois Modified AASHTO T 23, and may be insulated or power operated as appropriate.

**1020.10 Handling, Measuring, and Batching Materials.** Aggregates shall be handled in a manner to prevent mixing with soil and other foreign material.

Aggregates shall be handled in a manner which produces a uniform gradation, before placement in the plant bins. Aggregates delivered to the plant in a nonuniform gradation condition shall be stockpiled. The stockpiled aggregate shall be mixed uniformly before placement in the plant bins.

Aggregates shall have a uniform moisture content before placement in the plant bins. This may require aggregates to be stockpiled for 12 hours or more to allow drainage, or water added to the stockpile, or other methods approved by the Engineer. Moisture content requirements for crushed concrete, crushed slag or lightweight aggregate shall be according to Article 1004.01(e)(5).

Aggregates, cement, and finely divided minerals shall be measured by weight (mass). Water and admixtures shall be measured by volume or weight (mass).

The Engineer may permit aggregates, cement, and finely divided minerals to be measured by volume for small isolated structures and for miscellaneous items. Aggregates, cement, and finely divided minerals shall be measured individually. The volume shall be based upon dry, loose materials.

**1020.11 Mixing Portland Cement Concrete.** The mixing of concrete shall be according to the following.

- (a) Ready-Mixed Concrete. Ready-mixed concrete is central-mixed, truck-mixed, or shrink-mixed concrete transported and delivered in a plastic state ready for placement in the work and shall be according to the following.

- (1) Central-Mixed Concrete. Central-mixed concrete is concrete which has been completely mixed in a stationary mixer and delivered in a truck agitator, a truck mixer operating at agitating speed, or a nonagitator truck.

The stationary mixer shall operate at the drum speed for which it was designed. The batch shall be charged into the drum so that some of the water shall enter in advance of the cement, finely divided minerals, and aggregates. The flow of the water shall be uniform and all water shall be in the drum by the end of the first 15 seconds of the mixing period. Water shall begin to enter the drum from zero to two seconds in advance of solid material and shall stop flowing within two seconds of the beginning of mixing time.

Some coarse aggregate shall enter in advance of other solid materials. For the balance of the charging time for solid materials, the aggregates, finely divided minerals, and cement (to assure thorough blending) shall each flow at acceptably uniform rates, as determined by visual observation. Coarse aggregate shall enter two seconds in advance of other solid materials and a uniform rate of flow shall continue to within two seconds of the completion of charging time.

The entire contents of the drum, or of each single compartment of a multiple-drum mixer, shall be discharged before the succeeding batch is introduced.

The volume of concrete mixed per batch shall not exceed the mixer's rated capacity as shown on the standard rating plate on the mixer by more than ten percent.

The minimum mixing time shall be 75 seconds for a stationary mixer having a capacity greater than 2 cu yd (1.5 cu m). For a mixer with a capacity equal to or less than 2 cu yd (1.5 cu m) the mixing time shall be 60 seconds. Transfer time in multiple drum mixers is included in the mixing time. Mixing time shall begin when all materials are in the mixing compartment and shall end when the discharge of any part of the batch is started. The required mixing times will be established by the Engineer for all types of stationary mixers.

When central-mixed concrete is to be transported in a truck agitator or a truck mixer, the stationary-mixed batch shall be transferred to the agitating unit without delay and without loss of any portion of the batch. Agitating shall start immediately thereafter and shall continue without interruption until the batch is discharged from the agitator. The ingredients of the batch shall be completely discharged from the agitator before the succeeding batch is introduced. Drums and auxiliary parts of the equipment shall be kept free from accumulations of materials.

The vehicles used for transporting the mixed concrete shall be of such capacity, or the batches shall be so proportioned, that the entire contents of the mixer drum can be discharged into each vehicle load.

- (2) Truck-Mixed Concrete. Truck-mixed concrete is completely mixed and delivered in a truck mixer. When the mixer is charged with fine and coarse aggregates simultaneously, not less than 60 nor more than 100 revolutions of the drum or blades at mixing speed shall be required, after all of the ingredients including water are in the drum. When fine and coarse aggregates are charged separately, not less than 70 revolutions will be required. For self-consolidating concrete, a minimum of 100 revolutions is required in all cases. Additional mixing beyond 100 revolutions shall be at agitating speed unless additions of water, admixtures, or other materials are made at the jobsite. The mixing operation shall begin immediately after the cement and water, or the cement and wet aggregates, come in contact. The ingredients of the batch shall be completely discharged from the drum before the succeeding batch is introduced. The drum and auxiliary parts of the equipment shall be kept free from accumulations of materials. If additional water or an admixture is added at the jobsite, the concrete batch shall be mixed a minimum of 40 additional revolutions after each addition.
- (3) Shrink-Mixed Concrete. Shrink-mixed concrete is mixed partially in a stationary mixer and completed in a truck mixer for delivery. The mixing time of the stationary mixer may be reduced to a minimum of 30 seconds to intermingle the ingredients, before transferring to the truck mixer. All ingredients for the batch shall be in the stationary mixer and partially mixed before any of the mixture is discharged into the truck mixer. The partially mixed batch shall be transferred to the truck mixer without delay and without loss of any portion of the batch, and mixing in the truck mixer shall start immediately. The mixing time in the truck mixer shall be not less than 50 nor more than 100 revolutions of the drum or blades at mixing speed. For self-consolidating concrete, a minimum of 100 revolutions is required in the truck mixer. Additional mixing beyond 100 revolutions shall be at agitating speed, unless additions of water, admixtures, or other materials are made at the jobsite. Units designed as agitators shall not be used for shrink mixing. The ingredients of the batch shall be completely discharged from the drum before the succeeding batch is introduced. The drum and auxiliary parts of the equipment shall be kept free from accumulations of materials. If additional water or an admixture is added at the jobsite, the concrete batch shall be mixed a minimum of 40 additional revolutions after each addition.
- (4) Mixing Water. Wash water shall be completely discharged from the drum or container before a batch is introduced. All mixing water shall be added at the plant and any adjustment of water at the jobsite by the Contractor shall not exceed the specified maximum water/cement ratio or slump. If strength specimens have been made for a batch of concrete, and subsequently during discharge there is more water added, additional strength specimens shall be made for the batch of concrete. No additional water may be added at the jobsite to central-mixed concrete if the mix design has less than 565 lbs/cu yd (335 kg/cu m) of cement and finely divided minerals summed together.

- (5) **Mixing and Agitating Speeds.** The mixing or agitating speeds used for truck mixers or truck agitators shall be per the manufacturer's rating plate.
- (6) **Capacities.** The volume of plastic concrete in a given batch will be determined according to AASHTO T 121, based on the total weight (mass) of the batch, determined either from the weight (masses) of all materials, including water, entering the batch or directly from the net weight (mass) of the concrete in the batch as delivered.

The volume of mixed concrete in truck mixers or truck agitators shall in no case be greater than the rated capacity determined according to the Truck Mixer, Agitator, and Front Discharge Concrete Carrier Standards of the Truck Mixer Manufacturer's Bureau, as shown by the rating plate attached to the truck. If the truck mixer does not have a rating plate, the volume of mixed concrete shall not exceed 63 percent of the gross volume of the drum or container, disregarding the blades. For truck agitators, the value is 80 percent.

- (7) **Time of Haul.** Haul time shall begin when the delivery ticket is stamped. The delivery ticket shall be stamped no later than five minutes after the addition of the mixing water to the cement, or after the addition of the cement to the aggregate when the combined aggregates contain free moisture in excess of two percent by weight (mass). If more than one batch is required for charging a truck using a stationary mixer, the time of haul shall start with mixing of the first batch. Haul time shall end when the truck is emptied for incorporation of the concrete into the work.

The time elapsing from when water is added to the mix until it is deposited in place at the site of the work shall not exceed 30 minutes when the concrete is transported in nonagitating trucks.

The maximum haul time for concrete transported in truck mixers or truck agitators shall be according to the following.

Concrete Temperature at Point of Discharge °F (°C)	Haul Time	
	Hours	Minutes
50-64 (10-17.5)	1	30
>64 (>17.5) - without retarder	1	0
>64 (>17.5) - with retarder	1	30

To encourage start-up testing for mix adjustments at the plant, the first two trucks will be allowed an additional 15 minutes haul time whenever such testing is performed.

For a mixture which is not mixed on the jobsite, a delivery ticket shall be required for each load. The following information shall be recorded on each delivery ticket: (1) ticket number; (2) name of producer and plant location; (3) contract number; (4) name of Contractor; (5) stamped date and time batched; (6) truck number; (7) quantity batched; (8) amount of admixture(s) in the batch; (9) amount of water in the batch; and (10) Department mix design number.

For concrete mixed in jobsite stationary mixers, the above delivery ticket may be waived, but a method of verifying the haul time shall be established to the satisfaction of the Engineer.

- (8) Production and Delivery. The production of ready-mixed concrete shall be such that the operations of placing and finishing will be continuous insofar as the job operations require. The Contractor shall be responsible for producing concrete that will have the required workability, consistency, and plasticity when delivered to the work. Concrete which is unsuitable for placement as delivered will be rejected. The Contractor shall minimize the need to adjust the mixture at the jobsite, such as adding water and admixtures prior to discharging.
- (9) Use of Multiple Plants in the Same Construction Item. The Contractor may simultaneously use central-mixed, truck-mixed, and shrink-mixed concrete from more than one plant, for the same construction item, on the same day, and in the same pour. However, the following criteria shall be met.
  - a. Each plant shall use the same cement, finely divided minerals, aggregates, admixtures, and fibers.
  - b. Each plant shall use the same mix design. However, material proportions may be altered slightly in the field to meet slump and air content criteria. Field water adjustments shall not result in a difference that exceeds 0.02 between plants for water/cement ratio. The required cement factor for central-mixed concrete shall be increased to match truck-mixed or shrink-mixed concrete, if the latter two types of mixed concrete are used in the same pour.
  - c. The maximum slump difference between deliveries of concrete shall be 3/4 in. (19 mm) when tested at the jobsite. If the difference is exceeded, but test results are within specification limits, the concrete may be used. The Contractor shall take immediate corrective action and shall test subsequent deliveries of concrete until the slump difference is corrected. For each day, the first three truck loads of delivered concrete from each plant shall be tested for slump by the Contractor. Thereafter, when a specified test frequency for slump is to be performed, it shall be conducted for each plant at the same time.

- d. The maximum air content difference between deliveries of concrete shall be 1.5 percent when tested at the jobsite. If the difference is exceeded, but test results are within specification limits, the concrete may be used. The Contractor shall take immediate corrective action and shall test subsequent deliveries of concrete until the air content difference is corrected. For each day, the first three truck loads of delivered concrete from each plant shall be tested for air content by the Contractor. Thereafter, when a specified test frequency for air content is to be performed, it shall be conducted for each plant at the same time.
  - e. Strength tests shall be performed and taken at the jobsite for each plant. When a specified strength test is to be performed, it shall be conducted for each plant at the same time. The difference between plants for strength shall not exceed 900 psi (6200 kPa) compressive and 90 psi (620 kPa) flexural. If the strength difference requirements are exceeded, the Contractor shall take corrective action.
  - f. The maximum haul time difference between deliveries of concrete shall be 15 minutes. If the difference is exceeded, but haul time is within specification limits, the concrete may be used. The Contractor shall take immediate corrective action and check subsequent deliveries of concrete.
- (b) Class PC Concrete. The concrete shall be central-mixed or truck-mixed. Variations in plastic concrete properties shall be minimized between batches.
- (c) Class PV Concrete. The concrete shall be central-mixed, truck-mixed, or shrink-mixed.

The required mixing time for stationary mixers with a capacity greater than 2 cu yd (1.5 cu m) may be less than 75 seconds upon satisfactory completion of a mixer performance test. Mixer performance tests may be requested by the Contractor when the quantity of concrete to be placed exceeds 50,000 sq yd (42,000 sq m). The testing shall be conducted according to the current Bureau of Materials and Physical Research's Policy Memorandum, "Field Test Procedures for Mixer Performance and Concrete Uniformity Tests".

The Contractor will be allowed to test two mixing times within a range of 50 to 75 seconds. If satisfactory results are not obtained from the required tests, the mixing time shall continue to be 75 seconds for the remainder of the contract. If satisfactory results are obtained, the mixing time may be reduced. In no event will mixing time be less than 50 seconds.

The Contractor shall furnish the labor, equipment, and material required to perform the testing according to the current Bureau of Materials and Physical Research's Policy Memorandum, "Field Test Procedures for Mixer Performance and Concrete Uniformity Tests".

A contract which has 12 ft (3.6 m) wide pavement or base course, and a continuous length of 1/2 mile (0.8 km) or more, shall have the following additional requirements.

- (1) The plant and truck delivery operation shall be able to provide a minimum of 50 cu yd (38 cu m) of concrete per hour.
  - (2) The plant shall have automatic or semi-automatic batching equipment.
- (d) All Other Classes of Concrete. The concrete shall be central-mixed, truck-mixed, or shrink-mixed concrete.

**1020.12 Mobile Portland Cement Concrete Plants.** The use of a mobile portland cement concrete plant may be approved under the provisions of Article 1020.10 for volumetric proportioning in small isolated structures, thin overlays, and for miscellaneous and incidental concrete items.

The first 1 cu ft (0.03 cu m) of concrete produced may not contain sufficient mortar and shall not be incorporated in the work. The side plate on the cement feeder shall be removed periodically (normally the first time the mixer is used each day) to see if cement is building up on the feed drum.

Sufficient mixing capacity of mixers shall be provided to enable continuous placing and finishing insofar as the job operations and the specifications require.

Slump and air tests made immediately after discharge of the mix may be misleading, since the aggregates may absorb a significant amount of water for four or five minutes after mixing.

**1020.13 Curing and Protection.** The method of curing, curing period, and method of protection for each type of concrete construction is included in the following Index Table.



INDEX TABLE OF CURING AND PROTECTION OF CONCRETE CONSTRUCTION			
TYPE OF CONSTRUCTION	CURING METHODS	CURING PERIOD DAYS	LOW AIR TEMPERATURE PROTECTION METHODS
<b>Cast-in-Place Concrete <sup>11/</sup></b>			
Pavement			
Shoulder	1020.13(a)(1)(2)(3)(4)(5) <sup>3/ 5/</sup>	3	1020.13(c)
Base Course			
Base Course Widening	1020.13(a)(1)(2)(3)(4)(5) <sup>2/</sup>	3	1020.13(c)
Driveway			
Median			
Barrier			
Curb			
Gutter	1020.13(a)(1)(2)(3)(4)(5) <sup>4/ 5/</sup>	3	1020.13(c) <sup>16/</sup>
Curb & Gutter			
Sidewalk			
Slope Wall			
Paved Ditch			
Catch Basin			
Manhole	1020.13(a)(1)(2)(3)(4)(5) <sup>4/</sup>	3	1020.13(c)
Inlet			
Valve Vault			
Pavement Patching	1020.13(a)(1)(2)(3)(4)(5) <sup>2/</sup>	3 <sup>12/</sup>	1020.13(c)
Bridge Deck Patching	1020.13(a)(3)(5)	3 or 7 <sup>12/</sup>	1020.13(c)
Railroad Crossing	1020.13(a)(3)(5)	1	1020.13(c)
Piles and Drilled Shafts	1020.13(a)(3)(5)	7	1020.13(d)(1)(2)(3)
Foundations & Footings			
Seal Coat	1020.13(a)(1)(2)(3)(4)(5) <sup>4/ 6/</sup>	7	1020.13(d)(1)(2)(3)
Substructure	1020.13(a)(1)(2)(3)(4)(5) <sup>1/ 7/</sup>	7	1020.13(d)(1)(2)(3)
Superstructure (except deck)	1020.13(a)(1)(2)(3)(5) <sup>B/</sup>	7	1020.13(d)(1)(2)
Deck			
Bridge Approach Slab	1020.13(a)(5)	7	1020.13(d)(1)(2) <sup>17/</sup>
Retaining Walls	1020.13(a)(1)(2)(3)(4)(5) <sup>1/ 7/</sup>	7	1020.13(d)(1)(2)
Pump Houses	1020.13(a)(1)(2)(3)(4)(5) <sup>1/</sup>	7	1020.13(d)(1)(2)
Culverts	1020.13(a)(1)(2)(3)(4)(5) <sup>4/ 6/</sup>	7	1020.13(d)(1)(2) <sup>18/</sup>
Other Incidental Concrete	1020.13(a)(1)(2)(3)(5)	3	1020.13(c)
<b>Precast Concrete <sup>11/</sup></b>			
Bridge Slabs			
Piles and Pile Caps	1020.13(a)(3)(5) <sup>9/ 10/</sup>	As <sup>13/</sup>	9/
Other Structural Members		Required	
All Other Precast Items	1020.13(a)(3)(4)(5) <sup>2/ 9/ 10/</sup>	As <sup>14/</sup>	9/
		Required	
<b>Precast, Prestressed Concrete <sup>11/</sup></b>			
All Items	1020(a)(3)(5) <sup>9/ 10/</sup>	Until Strand Tensioning is Released <sup>15/</sup>	9/

Notes-General:

- 1/ Type I, membrane curing only
- 2/ Type II, membrane curing only
- 3/ Type III, membrane curing only

- 4/ Type I, II and III membrane curing
- 5/ Membrane Curing will not be permitted between November 1 and April 15.
- 6/ The use of water to inundate foundations and footings, seal coats or the bottom slab of culverts is permissible when approved by the Engineer, provided the water temperature can be maintained at 45 °F (7 °C) or higher.
- 7/ Asphalt emulsion for waterproofing may be used in lieu of other curing methods when specified and permitted according to Article 503.18. The top surfaces of abutments and piers shall be cured according to Article 1020.13(a)(3) or (5).
- 8/ On non-traffic surfaces which receive protective coat according to Article 503.19, a linseed oil emulsion curing compound may be used as a substitute for protective coat and other curing methods. The linseed oil emulsion curing compound will be permitted between April 16 and October 31 of the same year, provided it is applied with a mechanical sprayer according to Article 1101.09(b).
- 9/ Steam, supplemental heat, or insulated blankets (with or without steam/supplemental heat) are acceptable and shall be according to the Bureau of Materials and Physical Research's Policy Memorandum "Quality Control/Quality Assurance Program for Precast Concrete Products" and the "Manual for Fabrication of Precast, Prestressed Concrete Products".
- 10/ A moist room according to AASHTO M 201 is acceptable for curing.
- 11/ If curing is required and interrupted because of form removal for cast-in-place concrete items, precast concrete products, or precast prestressed concrete products, the curing shall be resumed within two hours from the start of the form removal.
- 12/ Curing maintained only until opening strength is attained for pavement patching, with a maximum curing period of three days. For bridge deck patching the curing period shall be three days if Class PP concrete is used and 7 days if Class BS concrete is used.
- 13/ The curing period shall end when the concrete has attained the mix design strength. The producer has the option to discontinue curing when the concrete has attained 80 percent of the mix design strength or after seven days. All strength test specimens shall remain with the units and shall be subjected to the same curing method and environmental condition as the units, until the time of testing.
- 14/ The producer shall determine the curing period or may elect to not cure the product. All strength test specimens shall remain with the units and shall be subjected to the same curing method and environmental condition as the units, until the time of testing.

15/ The producer has the option to continue curing after strand release.

16/ When structural steel or structural concrete is in place above slope wall, Article 1020.13(c) shall not apply. The protection method shall be according to Article 1020.13(d)(1).

17/ When Article 1020.13(d)(2) is used to protect the deck, the housing may enclose only the bottom and sides. The top surface shall be protected according to Article 1020.13(d)(1).

18/ For culverts having a waterway opening of 10 sq ft (1 sq m) or less, the culverts may be protected according to Article 1020.13(d)(3).

(a) Methods of Curing. Except as provided for in the Index Table of Curing and Protection of Concrete Construction, curing shall be accomplished by one of the following described methods. When water is required to wet the surface, it shall be applied as a fine spray so that it will not mar or pond on the surface. Except where otherwise specified, the curing period shall be at least 72 hours.

(1) Waterproof Paper Method. The surface of the concrete shall be covered with waterproof paper as soon as the concrete has hardened sufficiently to prevent marring the surface. The surface of the concrete shall be wetted immediately before the paper is placed. The blankets shall be lapped at least 12 in. (300 mm) end to end, and these laps shall be securely weighted with a windrow of earth, or other approved method, to form a closed joint. The same requirements shall apply to the longitudinal laps where separate strips are used for curing edges, except the lap shall be at least 9 in. (225 mm). The edges of the blanket shall be weighted securely with a continuous windrow of earth or any other means satisfactory to the Engineer to provide an air-tight cover. Any torn places or holes in the paper shall be repaired immediately by patches cemented over the openings, using a bituminous cement having a melting point of not less than 180 °F (82 °C). The blankets may be reused, provided they are air-tight and kept serviceable by proper repairs.

A longitudinal pleat shall be provided in the blanket to permit shrinkage where the width of the blanket is sufficient to cover the entire surface. The pleat will not be required where separate strips are used for the edges. Joints in the blanket shall be sewn or cemented together in such a manner that they will not separate during use.

- (2) Polyethylene Sheeting Method. The surface of the concrete shall be covered with white polyethylene sheeting as soon as the concrete has hardened sufficiently to prevent marring the surface. The surface of the concrete shall be wetted immediately before the sheeting is placed. The edges of the sheeting shall be weighted securely with a continuous windrow of earth or any other means satisfactory to the Engineer to provide an air-tight cover. Adjoining sheets shall overlap not less than 12 in. (300 mm) and the laps shall be securely weighted with earth, or any other means satisfactory to the Engineer, to provide an air tight cover. For surface and base course concrete, the polyethylene sheets shall be not less than 100 ft (30 m) in length nor longer than can be conveniently handled, and shall be of such width that, when in place, they will cover the full width of the surface, including the edges, except that separate strips may be used to cover the edges. Any tears or holes in the sheeting shall be repaired. When sheets are no longer serviceable as a single unit, the Contractor may select from such sheets and reuse those which will serve for further applications, provided two sheets are used as a single unit; however, the double sheet units will be rejected when the Engineer deems that they no longer provide an air tight cover.
- (3) Wetted Burlap Method. The surface of the concrete shall be covered with wetted burlap blankets as soon as the concrete has hardened sufficiently to prevent marring the surface. The blankets shall overlap 6 in. (150 mm). At least two layers of wetted burlap shall be placed on the finished surface. The burlap shall be kept saturated by means of a mechanically operated sprinkling system. In place of the sprinkling system, at the Contractor's option, two layers of burlap covered with impermeable covering shall be used. The burlap shall be kept saturated with water. Plastic coated burlap may be substituted for one layer of burlap and impermeable covering.

The blankets shall be placed so that they are in contact with the edges of the concrete, and that portion of the material in contact with the edges shall be kept saturated with water.

- (4) Membrane Curing Method. Membrane curing will not be permitted where a protective coat, concrete sealer, or waterproofing is to be applied, or at areas where rubbing or a normal finish is required, or at construction joints other than those necessary in pavement or base course. Concrete at these locations shall be cured by another method specified in Article 1020.13(a).

After all finishing work to the concrete surface has been completed, it shall be sealed with membrane curing compound of the type specified within ten minutes. The seal shall be maintained for the specified curing period. The edges of the concrete shall, likewise, be sealed within ten minutes after the forms are removed. Two separate applications, applied at least one minute apart, each at the rate of not less than 1 gal/250 sq ft (0.16 L/sq m) will be required upon the surfaces and edges of the concrete. These applications shall be made with the mechanical equipment specified. Type III compound shall be agitated immediately before and during the application.

At locations where the coating is discontinuous or where pin holes show or where the coating is damaged due to any cause and on areas adjacent to sawed joints, immediately after sawing is completed, an additional coating of membrane curing compound shall be applied at the above specified rate. The equipment used may be of the same type as that used for coating variable widths of pavement. Before the additional coating is applied adjacent to sawed joints, the cut faces of the joint shall be protected by inserting a suitable flexible material in the joint, or placing an adhesive width of impermeable material over the joint, or by placing the permanent sealing compound in the joint. Material, other than the permanent sealing compound, used to protect cut faces of the joint, shall remain in place for the duration of the curing period. In lieu of applying the additional coating, the area of the sawed joint may be cured according to any other method permitted.

When rain occurs before an application of membrane curing compound has dried, and the coating is damaged, the Engineer may require another application be made in the same manner and at the same rate as the original coat. The Engineer may order curing by another method specified, if unsatisfactory results are obtained with membrane curing compound.

- (5) Wetted Cotton Mat Method. After the surface of concrete has been textured or finished, it shall be covered immediately with dry or damp cotton mats. The cotton mats shall be placed in a manner which will not mar the concrete surface. A texture resulting from the cotton mat material is acceptable. The cotton mats shall then be wetted immediately and thoroughly soaked with a gentle spray of water. For bridge decks, a foot bridge shall be used to place and wet the cotton mats.

The cotton mats shall be maintained in a wetted condition until the concrete has hardened sufficiently to place soaker hoses without marring the concrete surface. The soaker hoses shall be placed on top of the cotton mats at a maximum 4 ft (1.2 m) spacing. The cotton mats shall be kept wet with a continuous supply of water for the remainder of the curing period. Other continuous wetting systems may be used if approved by the Engineer.

After placement of the soaker hoses, the cotton mats shall be covered with white polyethylene sheeting or burlap-polyethylene blankets.

For construction items other than bridge decks, soaker hoses or a continuous wetting system will not be required if the alternative method keeps the cotton mats wet. Periodic wetting of the cotton mats is acceptable.

For areas inaccessible to the cotton mats on bridge decks, curing shall be according to Article 1020.13(a)(3).

- (b) Removing and Replacing Curing Covering. When curing methods specified above in Article 1020.13(a), (1), (2), or (3) are used for concrete pavement, the curing covering for each day's paving shall be removed to permit testing of the pavement surface with a profilograph or straightedge, as directed by the Engineer.

Immediately after testing, the surface of the pavement shall be wetted thoroughly and the curing coverings replaced. The top surface and the edges of the concrete shall not be left unprotected for a period of more than 1/2 hour.

- (c) Protection of Concrete, Other Than Structures, From Low Air Temperatures. When the official National Weather Service forecast for the construction area predicts a low of 32 °F (0 °C), or lower, or if the actual temperature drops to 32 °F (0 °C), or lower, concrete less than 72 hours old shall be provided at least the following protection.

Minimum Temperature	Protection
25 – 32 °F (-4 – 0 °C)	Two layers of polyethylene sheeting, one layer of polyethylene and one layer of burlap, or two layers of waterproof paper.
Below 25 °F (-4 °C)	6 in. (150 mm) of straw covered with one layer of polyethylene sheeting or waterproof paper.

These protective covers shall remain in place until the concrete is at least 96 hours old. When straw is required on pavement cured with membrane curing compound, the compound shall be covered with a layer of burlap, polyethylene sheeting or waterproof paper before the straw is applied.

After September 15, there shall be available to the work within four hours, sufficient clean, dry straw to cover at least two days production. Additional straw shall be provided as needed to afford the protection required. Regardless of the precautions taken, the Contractor shall be responsible for protection of the concrete placed and any concrete damaged by cold temperatures shall be removed and replaced.

- (d) Protection of Concrete Structures From Low Air Temperatures. When the official National Weather Service forecast for the construction area predicts a low below 45 °F (7 °C), or if the actual temperature drops below 45 °F (7 °C), concrete less than 72 hours old shall be provided protection. Concrete shall also be provided protection when placed during the winter period of December 1 through March 15. Concrete shall not be placed until the materials, facilities, and equipment for protection are approved by the Engineer.

When directed by the Engineer, the Contractor may be required to place concrete during the winter period. When winter construction is specified, the Contractor shall proceed with the construction, including excavation, pile driving, concrete, steel erection, and all appurtenant work required for the complete construction of the item, except at times when weather conditions make such operations impracticable.

Regardless of the precautions taken, the Contractor shall be responsible for protection of the concrete placed and any concrete damaged by cold temperatures shall be removed and replaced.

- (1) Protection Method I. The concrete shall be completely covered with insulating material such as fiberglass, rock wool, or other approved commercial insulating material having the minimum thermal resistance R, as defined in ASTM C 168, for the corresponding minimum dimension of the concrete unit being protected as shown in the following table.

Minimum Pour Dimension		Thermal Resistance R
in.	(mm)	
6 or less	(150 or less)	R=16
> 6 to 12	(> 150 to 300)	R=10
> 12 to 18	(> 300 to 450)	R=6
> 18	(> 450)	R=4

The insulating material manufacturer shall clearly mark the insulating material with the thermal resistance R value.

The insulating material shall be completely enclosed on sides and edges with an approved waterproof liner and shall be maintained in a serviceable condition. Any tears in the liner shall be repaired in a manner approved by the Engineer. The Contractor shall provide means for checking the temperature of the surface of the concrete during the protection period.

On formed surfaces, the insulating material shall be attached to the outside of the forms with wood cleats or other suitable means to prevent any circulation of air under the insulation and shall be in place before the concrete is placed. The blanket insulation shall be applied tightly against the forms. The edges and ends shall be attached so as to exclude air and moisture. If the blankets are provided with nailing flanges, the flanges shall be attached to the studs with cleats. Where tie rods or reinforcement bars protrude, the areas adjacent to the rods or bars shall be adequately protected in a manner satisfactory to the Engineer. Where practicable, the insulation shall overlap any previously placed concrete by at least 1 ft (300 mm). Insulation on the underside of floors on steel members shall cover the top flanges of supporting members. On horizontal surfaces, the insulating material shall be placed as soon as the concrete has set, so that the surface will not be marred and shall be covered with canvas or other waterproof covering. The insulating material shall remain in place for a period of seven days after the concrete is placed.

The Contractor may remove the forms, providing the temperature is 35 °F (2 °C) and rising and the Contractor is able to wrap the particular section within two hours from the time of the start of the form removal. The insulation shall remain in place for the remainder of the seven days curing period.

- (2) Protection Method II. The concrete shall be enclosed in adequate housing and the air surrounding the concrete kept at a temperature of not less than 50 °F (10 °C) nor more than 80 °F (27 °C) for a period of seven days after the concrete is placed. The Contractor shall provide means for checking the temperature of the surface of the concrete or air temperature within the housing during the protection period. All exposed surfaces within the housing shall be cured according to the Index Table.

The Contractor shall provide adequate fire protection where heating is in progress and such protection shall be accessible at all times. The Contractor shall maintain labor to keep the heating equipment in continuous operation.

At the close of the heating period, the temperature shall be decreased to the approximate temperature of the outside air at a rate not to exceed 15 °F (8 °C) per 12 hour period, after which the housing maybe removed. The surface of the concrete shall be permitted to dry during the cooling period.

- (3) Protection Method III. As soon as the surface is sufficiently set to prevent marring, the concrete shall be covered with 12 in. (300 mm) of loose, dry straw followed by a layer of impermeable covering. The edges of the covering shall be sealed to prevent circulation of air and prevent the cover from flapping or blowing. The protection shall remain in place until the concrete is seven days old. If construction operations require removal, the protection removed shall be replaced immediately after completion or suspension of such operations.



**1020.14 Temperature Control for Placement.** Temperature control for concrete placement shall be according to the following.

- (a) Concrete other than Structures. Concrete may be placed when the air temperature is above 35 °F (2 °C) and rising, and concrete placement shall stop when the falling temperature reaches 40 °F (4 °C) or below, unless otherwise approved by the Engineer.

The temperature of concrete immediately before placement shall be a minimum of 50 °F (10 °C) and a maximum of 90 °F (32 °C). If concrete is pumped, the temperature of the concrete at point of placement shall be a minimum of 50 °F (10 °C) and a maximum of 90 °F (32 °C). A maximum concrete temperature shall not apply to Class PP concrete.

- (b) Concrete in Structures. Concrete may be placed when the air temperature is above 40 °F (4 °C) and rising, and concrete placement shall stop when the falling temperature reaches 45 °F (7 °C) or below, unless otherwise approved by the Engineer.

The temperature of the concrete immediately before placement shall be a minimum of 50 °F (10 °C) and a maximum of 90 °F (32 °C). If concrete is pumped, the temperature of the concrete at point of placement shall be a minimum of 50 °F (10 °C) and a maximum of 90 °F (32 °C).

When insulated forms are used according to Article 1020.13(d)(1), the maximum temperature of the concrete mixture immediately before placement shall be 80 °F (25 °C).

When concrete is placed in contact with previously placed concrete, the temperature of the freshly mixed concrete may be increased to 80 °F (25 °C) by the Contractor to offset anticipated heat loss.

- (c) All Classes of Concrete. Aggregates and water shall be heated or cooled uniformly and as necessary to produce concrete within the specified temperature limits. No frozen aggregates shall be used in the concrete.

- (d) Temperature. The concrete temperature shall be determined according to Illinois Modified AASHTO T 309.

**1020.15 Heat of Hydration Control for Concrete Structures.** The Contractor shall control the heat of hydration for concrete structures when the least dimension for a drilled shaft, foundation, footing, substructure, or superstructure concrete pour exceeds 5.0 ft (1.5 m). The work shall be according to the following.

- (a) Temperature Restrictions. The maximum temperature of the concrete after placement shall not exceed 150 °F (66 °C). The maximum temperature differential between the internal concrete core and concrete 2 to 3 in. (50 to 75 mm) from the exposed surface shall not exceed 35 °F (19 °C). The Contractor shall perform temperature monitoring to ensure compliance with the temperature restrictions.
- (b) Thermal Control Plan. The Contractor shall provide a thermal control plan a minimum of 28 calendar days prior to concrete placement for review by the Engineer. Acceptance of the thermal control plan by the Engineer shall not preclude the Contractor from specification compliance, and from preventing cracks in the concrete. At a minimum, the thermal control plan shall provide detailed information on the following requested items and shall comply with the specific specifications indicated for each item.
- (1) Concrete mix design(s) to be used. Grout mix design if post-cooling with embedded pipe.

The mix design requirements in Articles 1020.04 and 1020.05 shall be revised to include the following additional requirements to control the heat of hydration.

- a. The concrete mixture should be uniformly graded and preference for larger size aggregate should be used in the mix design. Article 1004.02(d)(2) shall apply and information in the "Portland Cement Concrete Level III Technician Course – Manual of Instructions for Design of Concrete Mixtures" may be used to develop the uniformly graded mixture.
- b. The following shall apply to all concrete except Class DS concrete or when self-consolidating concrete is desired. For central-mixed concrete, the Contractor shall have the option to develop a mixture with a minimum of 520 lbs/cu yd (309 kg/cu m) of cement and finely divided minerals summed together. For truck-mixed or shrink-mixed concrete, the Contractor shall have the option to develop a mixture with a minimum of 550 lbs/cu yd (326 kg/cu m) of cement and finely divided minerals summed together. A water-reducing or high range water-reducing admixture shall be used in the central mixed, truck-mixed or shrink-mixed concrete mixture. For any mixture to be placed underwater, the minimum cement and finely divided minerals shall be 550 lbs/cu yd (326 kg/cu m) for central-mixed concrete, and 580 lbs/cu yd (344 kg/cu m) for truck-mixed or shrink-mixed concrete.

For Class DS concrete, CA 11 may be used. If CA 11 is used, the Contractor shall have the option to develop a mixture with a minimum cement and finely divided minerals of 605 lbs/cu yd (360 kg/cu m) summed together. If CA 11 is used and either Class DS concrete is placed underwater or a self-consolidating concrete mixture is desired, the Contractor shall have the option to develop a mixture with a minimum cement and finely divided minerals of 635 lbs/cu yd (378 kg/cu m) summed together.

- c. The minimum portland cement content in the mixture shall be 375 lbs/cu yd (222 kg/cu m). When the total of organic processing additions, inorganic processing additions, and limestone addition exceed 5.0 percent in the cement, the minimum portland cement content in the mixture shall be 400 lbs/cu yd (237 kg/cu m). For a drilled shaft, foundation, footing, or substructure, the minimum portland cement may be reduced to as low as 330 lbs/cu yd (196 kg/cu m) if the concrete has adequate freeze/thaw durability. The Contractor shall provide freeze/thaw test results according to AASHTO T 161 Procedure A or B, and the relative dynamic modulus of elasticity of the mix design shall be a minimum of 80 percent. Freeze/thaw testing will not be required for concrete that will not be exposed to freezing and thawing conditions as determined by the Engineer.
- d. The maximum cement replacement with fly ash shall be 40.0 percent. The maximum cement replacement with ground granulated blast-furnace slag shall be 65.0 percent. When cement replacement with ground granulated blast-furnace slag exceeds 35.0 percent, only Grade 100 shall be used.
- e. The mixture may contain a maximum of two finely divided minerals. The finely divided mineral in portland-pozzolan cement or portland blast-furnace slag cement shall count toward the total number of finely divided minerals allowed. The finely divided minerals shall constitute a maximum of 65.0 percent of the total cement plus finely divided minerals. The fly ash portion shall not exceed 40.0 percent. The ground granulated blast-furnace slag portion shall not exceed 65.0 percent. The microsilica or high-reactivity metakaolin portion used together or separately shall not exceed 5.0 percent.
- f. The time to obtain the specified strength may be increased to a maximum 56 days, provided the curing period specified in Article 1020.13 is increased to a minimum of 14 days.

The minimum grout strength for filling embedded pipe shall be as specified for the concrete, and testing shall be according to AASHTO T 106.

- (2) The selected mathematical method for evaluating heat of hydration thermal effects, which shall include the calculated adiabatic temperature rise, calculated maximum concrete temperature, and calculated maximum temperature differential between the internal concrete core and concrete 2 to 3 in. (50 to 75 mm) from the exposed surface. The time when the maximum concrete temperature and maximum temperature differential will occur is required.

Acceptable mathematical methods include ACI 207.2R "Report on Thermal and Volume Change Effects on Cracking of Mass Concrete" as well as other proprietary methods. The Contractor shall perform heat of hydration testing on the cement and finely divided minerals to be used in the concrete mixture. The test shall be according to ASTM C 186 or other applicable test methods, and the result for heat shall be used in the equation to calculate adiabatic temperature rise. Other required test parameters for the mathematical model may be assumed if appropriate.

The Contractor has the option to propose a higher maximum temperature differential between the internal concrete core and concrete 2 to 3 in. (50 to 75 mm) from the exposed surface, but the proposed value shall not exceed 50 °F (28 °C). In addition, based on strength gain of the concrete, multiple maximum temperature differentials at different times may be proposed. The proposed value shall be justified through a mathematical method.

- (3) Proposed maximum concrete temperature or temperature range prior to placement.

Article 1020.14 shall apply except a minimum 40 °F (4 °C) concrete temperature will be permitted.

- (4) Pre-cooling, post-cooling, and surface insulation methods that will be used to ensure the concrete will comply with the specified maximum temperature and specified or proposed temperature differential. For reinforcement that extends beyond the limits of the pour, the Contractor shall indicate if the reinforcement is required to be covered with insulation.

Refer to ACI 207.4R "Cooling and Insulating Systems for Mass Concrete" for acceptable methods that will be permitted. If embedded pipe is used for post-cooling, the material shall be polyvinyl chloride or polyethylene. The embedded pipe system shall be properly supported, and the Contractor shall subsequently inspect glued joints to ensure they are able to withstand free falling concrete. The embedded pipe system shall be leak tested after inspection of the glued joints, and prior to the concrete placement. The leak test shall be performed at maximum service pressure or higher for a minimum of 15 minutes. All leaks shall be repaired. The embedded pipe cooling water may be from natural sources such as streams and rivers, but shall be filtered to prevent system stoppages. When the embedded pipe is no longer needed, the surface connections to the pipe shall be removed to a depth of 4 in. (100 mm) below the surface of the concrete. The remaining pipe shall be completely filled with grout. The 4 in. (100 mm) deep concrete hole shall be filled with nonshrink grout. Form and insulation removal shall be done in a manner to prevent cracking and ensure the maximum temperature differential is maintained. Insulation shall be in good condition as determined by the Engineer and properly attached.

- (5) Dimensions of each concrete pour, location of construction joints, placement operations, pour pattern, lift heights, and time delays between lifts.

Refer to ACI 207.1R "Guide to Mass Concrete" for acceptable placement operations that will be permitted.

- (6) Type of temperature monitoring system, the number of temperature sensors, and location of sensors.

A minimum of two independent temperature monitoring systems and corresponding sensors shall be used.

The temperature monitoring system shall have a minimum temperature range of 32 °F (0 °C) to 212 °F (100 °C), an accuracy of  $\pm 2$  °F ( $\pm 1$  °C), and be able to automatically record temperatures without external power. Temperature monitoring shall begin once the sensor is encased in concrete, and with a maximum interval of one hour. Temperature monitoring may be discontinued after the maximum concrete temperature has been reached, post-cooling is no longer required, and the maximum temperature differential between the internal concrete core and the ambient air temperature does not exceed 35 °F (19 °C). The Contractor has the option to select a higher maximum temperature differential, but the proposed value shall not exceed 50 °F (28 °C). The proposed value shall be justified through a mathematical method.

At a minimum, a temperature sensor shall be located at the theoretical hottest portion of the concrete, normally the geometric center, and at the exterior face that will provide the maximum temperature differential. At the exterior face, the sensor shall be located 2 to 3 in. (50 to 75 mm) from the surface of the concrete. Sensors shall also be located a minimum of 1 in. (25 mm) away from reinforcement, and equidistant between cooling pipes if either applies. A sensor will also be required to measure ambient air temperature. The entrant/exit cooling water temperature for embedded pipe shall also be monitored.

Temperature monitoring results shall be provided to the Engineer a minimum of once each day and whenever requested by the Engineer. The report may be electronic or hard copy. The report shall indicate the location of each sensor, the temperature recorded, and the time recorded. The report shall be for all sensors and shall include ambient air temperature and entrant/exit cooling water temperatures. The temperature data in the report may be provided in tabular or graphical format, and the report shall indicate any corrective actions during the monitoring period. At the completion of the monitoring period, the Contractor shall provide the Engineer a final report that includes all temperature data and corrective actions.

- (7) Indicate contingency operations to be used if the maximum temperature or temperature differential of the concrete is reached after placement.

- (c) Temperature Restriction Violations. If the maximum temperature of the concrete after placement exceeds 150 °F (66 °C), but is equal to or less than 158 °F (70 °C), the concrete will be accepted if no cracking or other unacceptable defects are identified. If cracking or unacceptable defects are identified, Article 105.03 shall apply. If the concrete temperature exceeds 158 °F (70 °C), Article 105.03 shall apply.

If a temperature differential between the internal concrete core and concrete 2 to 3 in. (50 to 75 mm) from the exposed surface exceeds the specified or proposed maximum value allowed, the concrete will be accepted if no cracking or other unacceptable defects are identified. If unacceptable defects are identified, Article 105.03 shall apply.

When the maximum 150 °F (66 °C) concrete temperature or the maximum allowed temperature differential is violated, the Contractor shall implement corrective action prior to the next pour. In addition, the Engineer reserves the right to request a new thermal control plan for acceptance before the Contractor is allowed to pour again.

- (d) Inspection and Repair of Cracks. The Engineer will inspect the concrete for cracks after the temperature monitoring is discontinued, and the Contractor shall provide access for the Engineer to do the inspection. A crack may require repair by the Contractor as determined by the Engineer. The Contractor shall be responsible for the repair of all cracks. Protective coat or a concrete sealer shall be applied to a crack less than 0.007 in. (0.18 mm) in width. A crack that is 0.007 in. (0.18 mm) or greater shall be pressure injected with epoxy according to Section 590.

## **PORTLAND CEMENT CONCRETE EQUIPMENT (BDE)**

Effective: November 1, 2013

Add the following to the first paragraph of Article 1103.03(a)(5) of the Standard Specifications to read:

“As an alternative to a locking key, the start and finish time for mixing may be automatically printed on the batch ticket. The start and finish time shall be reported to the nearest second.”

## **PROGRESS PAYMENTS (BDE)**

Effective: November 2, 2013

Revise Article 109.07(a) of the Standard Specifications to read:

- “(a) Progress Payments. At least once each month, the Engineer will make a written estimate of the quantity of work performed in accordance with the contract, and the value thereof at the contract unit prices. The amount of the estimate approved as due for payment will be vouchered by the Department and presented to the State Comptroller for payment. No amount less than \$1000.00 will be approved for payment other than the final payment.

Progress payments may be reduced by liens filed pursuant to Section 23(c) of the Mechanics' Lien Act, 770 ILCS 60/23(c).

If a Contractor or subcontractor has defaulted on a loan issued under the Department's Disadvantaged Business Revolving Loan Program (20 ILCS 2705/2705-610), progress payments may be reduced pursuant to the terms of that loan agreement. In such cases, the amount of the estimate related to the work performed by the Contractor or subcontractor, in default of the loan agreement, will be offset, in whole or in part, and vouchered by the Department to the Working Capital Revolving Fund or designated escrow account. Payment for the work shall be considered as issued and received by the Contractor or subcontractor on the date of the offset voucher. Further, the amount of the offset voucher shall be a credit against the Department's obligation to pay the Contractor, the Contractor's obligation to pay the subcontractor, and the Contractor's or subcontractor's total loan indebtedness to the Department. The offset shall continue until such time as the entire loan indebtedness is satisfied. The Department will notify the Contractor and Fund Control Agent in a timely manner of such offset. The Contractor or subcontractor shall not be entitled to additional payment in consideration of the offset.

The failure to perform any requirement, obligation, or term of the contract by the Contractor shall be reason for withholding any progress payments until the Department determines that compliance has been achieved.”

## **QUALITY CONTROL/QUALITY ASSURANCE OF CONCRETE MIXTURES (BDE)**

Effective: January 1, 2012  
Revised: November 1, 2013

Add the following to Section 1020 of the Standard Specifications:

**“1020.16 Quality Control/Quality Assurance of Concrete Mixtures.** This Article specifies the quality control responsibilities of the Contractor for concrete mixtures (except Class PC and PS concrete), cement aggregate mixture II, and controlled low-strength material incorporated in the project, and defines the quality assurance and acceptance responsibilities of the Engineer.

A list of quality control/quality assurance (QC/QA) documents is provided in Article 1020.16(g), Schedule D.

A Level I Portland Cement Concrete (PCC) Technician shall be defined as an individual who has successfully completed the Department’s training for concrete testing.

A Level II Portland Cement Concrete (PCC) Technician shall be defined as an individual who has successfully completed the Department’s training for concrete proportioning.

A Level III Portland Cement Concrete (PCC) Technician shall be defined as an individual who has successfully completed the Department’s training for concrete mix design.

A Concrete Tester shall be defined as an individual who has successfully completed the Department’s training to assist with concrete testing and is monitored on a daily basis.

Aggregate Technician shall be defined as an individual who has successfully completed the Department’s training for gradation testing involving aggregate production and mixtures.

Mixture Aggregate Technician shall be defined as an individual who has successfully completed the Department’s training for gradation testing involving mixtures.

Gradation Technician shall be defined as an individual who has successfully completed the Department’s training to assist with gradation testing and is monitored on a daily basis.

- (a) Equipment/Laboratory. The Contractor shall provide a laboratory and test equipment to perform their quality control testing.



The laboratory shall be of sufficient size and be furnished with the necessary equipment, supplies, and current published test methods for adequately and safely performing all required tests. The laboratory will be approved by the Engineer according to the current Bureau of Materials and Physical Research Policy Memorandum "Minimum Private Laboratory Requirements for Construction Materials Testing or Mix Design". Production of a mixture shall not begin until the Engineer provides written approval of the laboratory. The Contractor shall refer to the Department's "Required Sampling and Testing Equipment for Concrete" for equipment requirements.

Test equipment shall be maintained and calibrated as required by the appropriate test method, and when required by the Engineer. This information shall be documented on the Department's "Calibration of Concrete Testing Equipment" form.

Test equipment used to determine compressive or flexural strength shall be calibrated each 12 month period by an independent agency, using calibration equipment traceable to the National Institute of Standards and Technology (NIST). The Contractor shall have the calibration documentation available at the test equipment location.

The Engineer will have unrestricted access to the plant and laboratory at any time to inspect measuring and testing equipment, and will notify the Contractor of any deficiencies. Defective equipment shall be immediately repaired or replaced by the Contractor.

- (b) Quality Control Plan. The Contractor shall submit, in writing, a proposed Quality Control (QC) Plan to the Engineer. The QC Plan shall be submitted a minimum of 45 calendar days prior to the production of a mixture. The QC Plan shall address the quality control of the concrete, cement aggregate mixture II, and controlled low-strength material incorporated in the project. The Contractor shall refer to the Department's "Model Quality Control Plan for Concrete Production" to prepare a QC Plan. The Engineer will respond in writing to the Contractor's proposed QC Plan within 15 calendar days of receipt.

Production of a mixture shall not begin until the Engineer provides written approval of the QC Plan. The approved QC Plan shall become a part of the contract between the Department and the Contractor, but shall not be construed as acceptance of any mixture produced.

The QC Plan may be amended during the progress of the work, by either party, subject to mutual agreement. The Engineer will respond in writing to a Contractor's proposed QC Plan amendment within 15 calendar days of receipt. The response will indicate the approval or denial of the Contractor's proposed QC Plan amendment.

- (c) Quality Control by Contractor. The Contractor shall perform quality control inspection, sampling, testing, and documentation to meet contract requirements. Quality control includes the recognition of obvious defects and their immediate correction. Quality control also includes appropriate action when passing test results are near specification limits, or to resolve test result differences with the Engineer. Quality control may require increased testing, communication of test results to the plant or the jobsite, modification of operations, suspension of mixture production, rejection of material, or other actions as appropriate. The Engineer shall be immediately notified of any failing tests and subsequent remedial action. Passing tests shall be reported no later than the start of the next work day.

When a mixture does not comply with specifications, the Contractor shall reject the material; unless the Engineer accepts the material for incorporation in the work, according to Article 105.03.

- (1) Personnel Requirements. The Contractor shall provide a Quality Control (QC) Manager who will have overall responsibility and authority for quality control. The jobsite and plant personnel shall be able to contact the QC Manager by cellular phone, two-way radio or other methods approved by the Engineer.

The QC Manager shall visit the jobsite a minimum of once a week. A visit shall be performed the day of a bridge deck pour, the day a non-routine mixture is placed as determined by the Engineer, or the day a plant is anticipated to produce more than 1000 cu yd (765 cu m). Any of the three required visits may be used to meet the once per week minimum requirement.

The Contractor shall provide personnel to perform the required inspections, sampling, testing and documentation in a timely manner. The Contractor shall refer to the Department's "Qualifications and Duties of Concrete Quality Control Personnel" document.

A Level I PCC Technician shall be provided at the jobsite during mixture production and placement, and may supervise concurrent pours on the project. For concurrent pours, a minimum of one Concrete Tester shall be required at each pour location. If the Level I PCC Technician is at one of the pour locations, a Concrete Tester is still required at the same location. Each Concrete Tester shall be able to contact the Level I PCC Technician by cellular phone, two-way radio or other methods approved by the Engineer. A single Level I PCC Technician shall not supervise concurrent pours for multiple contracts.

A Level II PCC Technician shall be provided at the plant, or shall be available, during mixture production and placement. A Level II PCC Technician may supervise a maximum of three plants. Whenever the Level II PCC Technician is not at the plant during mixture production and placement, a Concrete Tester or Level I PCC Technician shall be present at the plant to perform any necessary concrete tests. The Concrete Tester, Level I PCC Technician, or other individual shall also be trained to perform any necessary aggregate moisture tests, if the Level II PCC Technician is not at the plant during mixture production and placement. The Concrete Tester, Level I PCC Technician, plant personnel, and jobsite personnel shall have the ability to contact the Level II PCC Technician by cellular phone, two-way radio, or other methods approved by the Engineer.

For a mixture which is produced and placed with a mobile portland cement concrete plant as defined in Article 1103.04, a Level II PCC Technician shall be provided. The Level II PCC Technician shall be present at all times during mixture production and placement. However, the Level II PCC Technician may request to be available if operations are satisfactory. Approval shall be obtained from the Engineer, and jobsite personnel shall have the ability to contact the Level II PCC Technician by cellular phone, two-way radio, or other methods approved by the Engineer.

A Concrete Tester, Mixture Aggregate Technician, and Aggregate Technician may provide assistance with sampling and testing. A Gradation Technician may provide assistance with testing. A Concrete Tester shall be supervised by a Level I or Level II PCC Technician. A Gradation Technician shall be supervised by a Level II PCC Technician, Mixture Aggregate Technician, or Aggregate Technician.

- (2) Required Plant Tests. Sampling and testing shall be performed at the plant, or at a location approved by the Engineer, to control the production of a mixture. The required minimum Contractor plant sampling and testing is indicated in Article 1020.16(g) Schedule A.
- (3) Required Field Tests. Sampling and testing shall be performed at the jobsite to control the production of a mixture, and to comply with specifications for placement. For standard curing, after initial curing, and for strength testing; the location shall be approved by the Engineer. The required minimum Contractor jobsite sampling and testing is indicated in Article 1020.16(g), Schedule B.

(d) Quality Assurance by Engineer. The Engineer will perform quality assurance tests on independent samples and split samples. An independent sample is a field sample obtained and tested by only one party. A split sample is one of two equal portions of a field sample, where two parties each receive one portion for testing. The Engineer may request the Contractor to obtain a split sample. Aggregate split samples and any failing strength specimen shall be retained until permission is given by the Engineer for disposal. The results of all quality assurance tests by the Engineer will be made available to the Contractor. However, Contractor split sample test results shall be provided to the Engineer before Department test results are revealed. The Engineer's quality assurance independent sample and split sample testing is indicated in Article 1020.16(g), Schedule C.

(1) Strength Testing. For strength testing, Article 1020.09 shall apply, except the Contractor and Engineer strength specimens may be placed in the same field curing box for initial curing and may be cured in the same water storage tank for final curing.

(2) Comparing Test Results. Differences between the Engineer's and the Contractor's split sample test results will be considered reasonable if within the following limits:

Test Parameter	Acceptable Limits of Precision
Slump	0.75 in. (20 mm)
Air Content	0.9%
Compressive Strength	900 psi (6200 kPa)
Flexural Strength	90 psi (620 kPa)
Slump Flow (Self-Consolidating Concrete (SCC))	1.5 in. (40 mm)
Visual Stability Index (SCC)	Not Applicable
J-Ring (SCC)	1.5 in. (40 mm)
L-Box (SCC)	10 %
Hardened Visual Stability Index (SCC)	Not Applicable
Dynamic Segregation Index (SCC)	1.0 %
Flow (Controlled Low-Strength Material (CLSM))	1.5 in. (40 mm)
Strength (Controlled Low-Strength Material (CLSM))	40 psi (275 kPa)
Aggregate Gradation	See "Guideline for Sample Comparison" in Appendix "A" of the Manual of Test Procedures for Materials.

When acceptable limits of precision have been met, but only one party is within specification limits, the failing test shall be resolved before the material may be considered for acceptance.

(3) Test Results and Specification Limits.

- a. Split Sample Testing. If either the Engineer's or the Contractor's split sample test result is not within specification limits, and the other party is within specification limits; immediate retests on a split sample shall be performed for slump, air content, slump flow, visual stability index, J-Ring, L-Box, dynamic segregation index, flow (CLSM), or aggregate gradation. A passing retest result by each party will require no further action. If either the Engineer's or Contractor's slump, air content, slump flow, visual stability index, J-Ring, L-Box, dynamic segregation index, flow (CLSM), or aggregate gradation split sample retest result is a failure; or if either the Engineer's or Contractor's strength or hardened visual stability index test result is a failure, and the other party is within specification limits; the following actions shall be initiated to investigate the test failure:
1. The Engineer and the Contractor shall investigate the sampling method, test procedure, equipment condition, equipment calibration, and other factors.
  2. The Engineer or the Contractor shall replace test equipment, as determined by the Engineer.
  3. The Engineer and the Contractor shall perform additional testing on split samples, as determined by the Engineer.

For aggregate gradation, jobsite slump, jobsite air content, jobsite slump flow, jobsite visual stability index, jobsite J-Ring, jobsite L-Box, jobsite dynamic segregation index, and jobsite flow (CLSM); if the failing split sample test result is not resolved according to 1., 2., or 3., and the mixture has not been placed, the Contractor shall reject the material; unless the Engineer accepts the material for incorporation in the work according to Article 105.03. If the mixture has already been placed, or if a failing strength or hardened visual stability index test result is not resolved according to 1., 2., or 3., the material will be considered unacceptable.

If a continued trend of difference exists between the Engineer's and the Contractor's split sample test results, or if split sample test results exceed the acceptable limits of precision, the Engineer and the Contractor shall investigate according to items 1., 2., and 3.

- b. Independent Sample Testing. For aggregate gradation, jobsite slump, jobsite air content jobsite slump flow, jobsite visual stability index, jobsite J-Ring, jobsite L-Box, jobsite dynamic segregation index, jobsite flow (CLSM); if the result of a quality assurance test on a sample independently obtained by the Engineer is not within specification limits, and the mixture has not been placed, the Contractor shall reject the material, unless the Engineer accepts the material for incorporation in the work according to Article 105.03. If the mixture has already been placed or the Engineer obtains a failing strength or hardened visual stability index test result, the material will be considered unacceptable.

(e) Acceptance by the Engineer. Final acceptance will be based on the Standard Specifications and the following:

- (1) The Contractor's compliance with all contract documents for quality control.
- (2) Validation of Contractor quality control test results by comparison with the Engineer's quality assurance test results using split samples. Any quality control or quality assurance test determined to be flawed may be declared invalid only when reviewed and approved by the Engineer. The Engineer will declare a test result invalid only if it is proven that improper sampling or testing occurred. The test result is to be recorded and the reason for declaring the test invalid will be provided by the Engineer.
- (3) Comparison of the Engineer's quality assurance test results with specification limits using samples independently obtained by the Engineer.

The Engineer may suspend mixture production, reject materials, or take other appropriate action if the Contractor does not control the quality of concrete, cement aggregate mixture II, or controlled low-strength material for acceptance. The decision will be determined according to (1), (2), or (3).

(f) Documentation.

- (1) Records. The Contractor shall be responsible for documenting all observations, inspections, adjustments to the mix design, test results, retest results, and corrective actions in a bound hardback field book, bound hardback diary, or appropriate Department form, which shall become the property of the Department. The documentation shall include a method to compare the Engineer's test results with the Contractor's results. The Contractor shall be responsible for the maintenance of all permanent records whether obtained by the Contractor, the consultants, the subcontractors, or the producer of the mixture. The Contractor shall provide the Engineer full access to all documentation throughout the progress of the work.

The Department's form MI 504M, form BMPR MI654, and form BMPR MI655 shall be completed by the Contractor, and shall be submitted to the Engineer weekly or as required by the Engineer. A correctly completed form MI 504M, form BMPR MI654, and form BMPR MI655 are required to authorize payment by the Engineer, for applicable pay items.

- (2) Delivery Truck Ticket. The following information shall be recorded on each delivery ticket or in a bound hardback field book: initial revolution counter reading (final reading optional) at the jobsite, if the mixture is truck-mixed; time discharged at the jobsite; total amount of each admixture added at the jobsite; and total amount of water added at the jobsite.
  
- (g) Basis of Payment and Schedules. Quality Control/Quality Assurance of portland cement concrete mixtures will not be paid for separately, but shall be considered as included in the cost of the various concrete contract items.

SCHEDULE A

CONTRACTOR PLANT SAMPLING AND TESTING			
Item	Test	Frequency	IL Modified AASHTO or Department Test Method <sup>1/</sup>
Aggregates (Arriving at Plant)	Gradation <sup>2/</sup>	As needed to check source for each gradation number	2, 11, 27, and 248
Aggregates (Stored at Plant in Stockpiles or Bins)	Gradation <sup>2/</sup>	2,500 cu yd (1,900 cu m) for each gradation number <sup>3/</sup>	2, 11, 27, and 248
Aggregates (Stored at Plant in Stockpiles or Bins)	Moisture <sup>4/</sup> : Fine Aggregate	Once per week for moisture sensor, otherwise daily for each gradation number	Flask, Dunagan, Pycnometer Jar, or 255
	Moisture <sup>4/</sup> : Coarse Aggregate	As needed to control production for each gradation number	Dunagan, Pycnometer Jar, or 255
Mixture <sup>5/</sup>	Slump Air Content Unit Weight / Yield Slump Flow (SCC) Visual Stability Index (SCC) J-Ring (SCC) <sup>6/</sup> L-Box (SCC) <sup>6/</sup> Temperature	As needed to control production	T 141 and T 119 T 141 and T 152 or T 196 T 141 and T 121 SCC-1 and SCC-2 SCC-1 and SCC-2 SCC-1 and SCC-3 SCC-1 and SCC-4 T 141 and T 309
Mixture (CLSM) <sup>7/</sup>	Flow Air Content Temperature	As needed to control production	Illinois Test Procedure 307

1/ Refer to the Department's "Manual of Test Procedures for Materials".

2/ All gradation tests shall be washed. Testing shall be completed no later than 24 hours after the aggregate has been sampled.

3/ One per week (Sunday through Saturday) minimum unless the stockpile has not received additional aggregate material since the previous test.

One per day minimum for a bridge deck pour unless the stockpile has not received additional aggregate material since the previous test. The sample shall be taken and testing completed prior to the pour. The bridge deck aggregate sample may be taken the day before the pour or as approved by the Engineer.

4/ If the moisture test and moisture sensor disagree by more than 0.5 percent, retest. If the difference remains, adjust the moisture sensor to an average of two or more moisture tests. The Department's "Water/Cement Ratio Worksheet" form shall be completed when applicable.

5/ The Contractor may also perform strength testing according to Illinois Modified AASHTO T 141, T 23, and T 22 or T 177; or water content testing according to Illinois Modified AASHTO T 318.



The Contractor may also perform other available self-consolidating concrete (SCC) tests at the plant to control mixture production.

- 6/ The Contractor shall select the J-Ring or L-Box test for plant sampling and testing.
- 7/ The Contractor may also perform strength testing according to Illinois Test Procedure 307.

SCHEDULE B

CONTRACTOR JOBSITE SAMPLING & TESTING <sup>1/</sup>			
Item	Measured Property	Random Sample Testing Frequency per Mix Design and per Plant <sup>2/</sup>	IL Modified AASHTO Test Method
Pavement, Shoulder, Base Course, Base Course Widening, Driveway Pavement, Railroad Crossing, Cement Aggregate Mixture II	Slump <sup>3/ 4/</sup>	1 per 500 cu yd (400 cu m) or minimum 1/day	T 141 and T 119
	Air Content <sup>3/ 5/ 6/</sup>	1 per 100 cu yd (80 cu m) or minimum 1/day	T 141 and T 152 or T 196
	Compressive Strength <sup>7/ 8/</sup> or Flexural Strength <sup>7/ 8/</sup>	1 per 1250 cu yd (1000 cu m) or minimum 1/day	T 141, T 22 and T 23 or T 141, T 177 and T 23
Bridge Approach Slab <sup>9/</sup> , Bridge Deck <sup>9/</sup> , Bridge Deck Overlay <sup>9/</sup> , Superstructure <sup>9/</sup> , Substructure, Culvert, Miscellaneous Drainage Structures, Retaining Wall, Building Wall, Drilled Shaft Pile & Encasement Footing, Foundation, Pavement Patching, Structural Repairs	Slump <sup>3/ 4/</sup>	1 per 50 cu yd (40 cu m) or minimum 1/day	T 141 and T 119
	Air Content <sup>3/ 5/ 6/</sup>	1 per 50 cu yd (40 cu m) or minimum 1/day	T 141 and T 152 or T 196
	Compressive Strength <sup>7/ 8/</sup> or Flexural Strength <sup>7/ 8/</sup>	1 per 250 cu yd (200 cu m) or minimum 1/day	T 141, T 22 and T 23 or T 141, T 177 and T 23
Seal Coat	Slump <sup>3/</sup>	1 per 250 cu yd (200 cu m) or minimum 1/day	T 141 and T 119
	Air Content <sup>3/ 5/ 6/</sup>	1 per 250 cu yd (200 cu m) or minimum 1/day when air is entrained	T 141 and T 152 or T 196
	Compressive Strength <sup>7/ 8/</sup> or Flexural Strength <sup>7/ 8/</sup>	1 per 250 cu yd (200 cu m) or minimum 1/day	T 141, T 22 and T 23 or T 141, T 177 and T 23

CONTRACTOR JOBSITE SAMPLING & TESTING <sup>1/</sup>			
Curb, Gutter, Median, Barrier, Sidewalk, Slope Wall, Paved Ditch, Fabric Formed Concrete Revetment Mat <sup>10/</sup> , Miscellaneous Items, Incidental Items	Slump <sup>3/ 4/</sup>	1 per 100 cu yd (80 cu m) or minimum 1/day	T 141 and T 119
	Air Content <sup>3/ 5/ 6/</sup>	1 per 50 cu yd (40 cu m) or minimum 1/day	T 141 and T 152 or T 196
	Compressive Strength <sup>7/ 8/</sup> or Flexural Strength <sup>7/ 8/</sup>	1 per 400 cu yd (300 cu m) or minimum 1/day	T 141, T 22 and T 23 or T 141, T 177 and T 23
The Item will use a Self-Consolidating Concrete Mixture	Slump Flow <sup>3/</sup> VSI <sup>3/</sup> J-Ring <sup>3/ 11/</sup> L-Box <sup>3/ 11/</sup>	Perform at same frequency that is specified for the Item's slump	SCC-1 & SCC-2 SCC-1 & SCC-2 SCC-1 & SCC-3 SCC-1 & SCC-4
The Item will use a Self-Consolidating Concrete Mixture	HVSI <sup>12/</sup>	Minimum 1/day at start of production for that day	SCC-1 and SCC-6
The Item will use a Self-Consolidating Concrete Mixture	Dynamic Segregation Index (DSI)	Minimum 1/week at start of production for that week	SCC-1 and SCC-8 (Option C)
The Item will use a Self-Consolidating Concrete Mixture	Air Content <sup>3/ 5/ 6/</sup>	Perform at same frequency that is specified for the Item's air content	SCC-1 and T 152 or T 196
The Item will use a Self-Consolidating Concrete Mixture	Compressive Strength <sup>7/ 8/</sup> or Flexural Strength <sup>7/ 8/</sup>	Perform at same frequency that is specified for the Item's strength	SCC-1, T 22 and T 23 or SCC-1, T 177 and T 23
All	Temperature <sup>3/</sup>	As needed to control production	T 141 and T 309
Controlled Low-Strength Material (CLSM)	Flow, Air Content, Compressive Strength (28-day) <sup>13/</sup> , and Temperature	First truck load delivered and as needed to control production thereafter	Illinois Test Procedure 307

1/ Sampling and testing of small quantities of curb, gutter, median, barrier, sidewalk, slope wall, paved ditch, miscellaneous items, and incidental items may be waived by the Engineer if requested by the Contractor. However, quality control personnel are still required according to Article 1020.16(c)(1) The Contractor shall also provide recent evidence that similar material has been found to be satisfactory under normal sampling and testing procedures. The total quantity that may be waived for testing shall not exceed 100 cu yd (76 cu m) per contract.

If the Contractor's or Engineer's test result for any jobsite mixture test is not within the specification limits, all subsequent truck loads delivered shall be tested by the Contractor until the problem is corrected.

- 2/ If one mix design is being used for several construction items during a day's production, one testing frequency may be selected to include all items. The construction items shall have the same slump, air content, and water/cement ratio specifications. For self-consolidating concrete, the construction items shall have the same slump flow, visual stability index, J-Ring, L-Box, air content, and water/cement ratio specifications. The frequency selected shall equal or exceed the testing required for the construction item.

One sufficiently sized sample shall be taken to perform the required test(s). Random numbers shall be determined according to the Department's "Method for Obtaining Random Samples for Concrete". The Engineer will provide random sample locations.

- 3/ The temperature, slump, and air content tests shall be performed on the first truck load delivered, for each pour. For self consolidating concrete, the temperature, slump flow, visual stability index, J-Ring or L-Box, and air content tests shall be performed on the first truck load delivered, for each pour. Unless a random sample is required for the first truck load, testing the first truck load does not satisfy random sampling requirements.
- 4/ The slump random sample testing frequency shall be a minimum 1/day for a construction item which is slipformed.
- 5/ If a pump or conveyor is used for placement, a correction factor shall be established to allow for a loss of air content during transport. The first three truck loads delivered shall be tested, before and after transport by the pump or conveyor, to establish the correction factor. Once the correction is determined, it shall be re-checked after an additional 50 cu yd (40 cu m) is pumped, or an additional 100 cu yd (80 cu m) is conveyed. This shall continue throughout the pour. If the re-check indicates the correction factor has changed, a minimum of two truckloads is required to re-establish the correction factor. The correction factor shall also be re-established when significant changes in temperature, distance, pump or conveyor arrangement, and other factors have occurred. If the correction factor is >3.0 percent, the Contractor shall take corrective action to reduce the loss of air content during transport by the pump or conveyor. The Contractor shall record all air content test results, correction factors and corrected air contents. The corrected air content shall be reported on form BMPR MI654.
- 6/ If the Contractor's or Engineer's air content test result is within the specification limits, and 0.2 percent or closer to either limit, the next truck load delivered shall be tested by the Contractor. For example, if the specified air content range is 5.0 to 8.0 percent and the test result is 5.0, 5.1, 5.2, 7.8, 7.9 or 8.0 percent, the next truck shall be tested by the Contractor.

- 7/ The test of record for strength shall be the day indicated in Article 1020.04. For cement aggregate mixture II, a strength requirement is not specified and testing is not required. Additional strength testing to determine early falsework and form removal, early pavement or bridge opening to traffic, or to monitor strengths is at the discretion of the Contractor. Strength shall be defined as the average of two 6 x 12 in. (150 x 300 mm) cylinder breaks, three 4 x 8 in. (100 x 200 mm) cylinder breaks, or two beam breaks for field tests. Per Illinois Modified AASHTO T 23, cylinders shall be 6 x 12 in. (150 x 300 mm) when the nominal maximum size of the coarse aggregate exceeds 1 in. (25 mm).
- 8/ In addition to the strength test, a slump test, air content test, and temperature test shall be performed on the same sample. For self-consolidating concrete, a slump flow test, visual stability index test, J-Ring or L-Box test, air content test, and temperature test shall be performed on the same sample as the strength test. For mixtures pumped or conveyed, the Contractor shall sample according to Illinois Modified AASHTO T 141.
- 9/ The air content test will be required for each delivered truck load.
- 10/ For fabric formed concrete revetment mat, the slump test is not required and the flexural strength test is not applicable.
- 11/ The Contractor shall select the J-Ring or L-Box test for jobsite sampling and testing.
- 12/ In addition to the hardened visual stability index (HVSI) test, a slump flow test, visual stability index (VSI) test, J-Ring or L-Box test, air content test, and temperature test shall be performed on the same sample. The Contractor shall retain all hardened visual stability index cut cylinder specimens until the Engineer notifies the Contractor that the specimens may be discarded.
- 13/ The test of record for strength shall be the day indicated in Article 1019.04. In addition to the strength test, a flow test, air content test, and temperature test shall be performed on the same sample. The strength test may be waived by the Engineer if future removal of the material is not a concern.

SCHEDULE C

ENGINEER QUALITY ASSURANCE INDEPENDENT SAMPLE TESTING		
Location	Measured Property	Testing Frequency <sup>1/</sup>
Plant	Gradation of aggregates stored in stockpiles or bins, Slump and Air Content	As determined by the Engineer.
Jobsite	Slump, Air Content, Slump Flow, Visual Stability Index, J-Ring, L-Box, Hardened Visual Stability Index, Dynamic Segregation Index and Strength	As determined by the Engineer.
	Flow, Air Content, Strength (28-day), and Dynamic Cone Penetration for Controlled Low-Strength Material (CLSM)	As determined by the Engineer

ENGINEER QUALITY ASSURANCE SPLIT SAMPLE TESTING		
Location	Measured Property	Testing Frequency <sup>1/</sup>
Plant	Gradation of aggregates stored in stockpiles or bins <sup>2/</sup>	At the beginning of the project, the first test performed by the Contractor. Thereafter, a minimum of 10% of total tests required of the Contractor will be performed per aggregate gradation number and per plant.
	Slump and Air Content	As determined by the Engineer.
Jobsite	Slump <sup>2/</sup> , Air Content <sup>2/3/</sup> , Slump Flow <sup>2/</sup> , Visual Stability Index <sup>2/</sup> , J-Ring <sup>2/</sup> and L-box <sup>2/</sup>	At the beginning of the project, the first three tests performed by the Contractor. Thereafter, a minimum of 20% of total tests required of the Contractor will be performed per plant, which will include a minimum of one test per mix design.
	Hardened Visual Stability Index <sup>2/</sup>	As determined by the Engineer.
	Dynamic Segregation Index <sup>2/</sup>	As determined by the Engineer.
	Strength <sup>2/</sup>	At the beginning of the project, the first test performed by the Contractor. Thereafter, a minimum of 20% of total tests required of the Contractor will be performed per plant, which will include a minimum of one test per mix design.
	Flow, Air Content, and Strength (28-day) for Controlled Low-Strength Material (CLSM)	As determined by the Engineer.

- 1/ The Engineer will perform the testing throughout the period of quality control testing by the Contractor.
- 2/ The Engineer will witness and take immediate possession of or otherwise secure the Department's split sample obtained by the Contractor.
- 3/ Before transport by pump or conveyor, a minimum of 20 percent of total tests required of the Contractor will be performed per mix design and per plant. After transport by pump or conveyor, a minimum of 20 percent of total tests required of the Contractor will be performed per mix design and per plant.

SCHEDULE D

CONCRETE QUALITY CONTROL AND QUALITY ASSURANCE DOCUMENTS

- (a) Model Quality Control Plan for Concrete Production (\*)
- (b) Qualifications and Duties of Concrete Quality Control Personnel (\*)
- (c) Development of Gradation Bands on Incoming Aggregate at Mix Plants (\*)
- (d) Required Sampling and Testing Equipment for Concrete (\*)
- (e) Method for Obtaining Random Samples for Concrete (\*)
- (f) Calibration of Concrete Testing Equipment (BMPR PCCQ01 through BMPR PCCQ09) (\*)
- (g) Water/Cement Ratio Worksheet (BMPR PCCW01) (\*)
- (h) Field/Lab Gradations (MI 504M) (\*)
- (i) Concrete Air, Slump and Quantity (BMPR MI654) (\*)
- (j) P.C. Concrete Strengths (BMPR MI655) (\*)
- (k) Aggregate Technician Course or Mixture Aggregate Technician Course (\*)
- (l) Portland Cement Concrete Tester Course (\*)
- (m) Portland Cement Concrete Level I Technician Course - Manual of Instructions for Concrete Testing (\*)
- (n) Portland Cement Concrete Level II Technician Course - Manual of Instructions for Concrete Proportioning (\*)
- (o) Portland Cement Concrete Level III Technician Course - Manual of Instructions for Design of Concrete Mixtures (\*)
- (p) Manual of Test Procedures for Materials

\* Refer to Appendix C of the Manual of Test Procedures for Materials for more information.”



## REINFORCEMENT BARS (BDE)

Effective: November 1, 2013

Revise the first and second paragraphs of Article 508.05 of the Standard Specifications to read:

**“508.05 Placing and Securing.** All reinforcement bars shall be placed and tied securely at the locations and in the configuration shown on the plans prior to the placement of concrete. Manual welding of reinforcement may only be permitted on precast concrete products as indicated in the current Bureau of Materials and Physical Research Policy Memorandum “Quality Control / Quality Assurance Program for Precast Concrete Products”, and for precast prestressed concrete products as indicated in the Department’s current “Manual for Fabrication of Precast Prestressed Concrete Products”. Reinforcement bars shall not be placed by sticking or floating into place or immediately after placement of the concrete.

Bars shall be tied at all intersections, except where the center to center dimension is less than 1 ft (300 mm) in each direction, in which case alternate intersections shall be tied. Molded plastic clips may be used in lieu of wire to secure bar intersections, but shall not be permitted in horizontal bar mats subject to construction foot traffic or to secure longitudinal bar laps. Plastic clips shall adequately secure the reinforcement bars, and shall permit the concrete to flow through and fully encase the reinforcement. Plastic clips may be recycled plastic, and shall meet the approval of the Engineer. The number of ties as specified shall be doubled for lap splices at the stage construction line of concrete bridge decks when traffic is allowed on the first completed stage during the pouring of the second stage.”

Revise the fifth paragraph of Article 508.05 of the Standard Specifications to read:

“Supports for reinforcement in bridge decks shall be metal. For all other concrete construction the supports shall be metal or plastic. Metal bar supports shall be made of cold-drawn wire, or other approved material and shall be either epoxy coated, galvanized or plastic tipped. When the reinforcement bars are epoxy coated, the metal supports shall be epoxy coated. Plastic supports may be recycled plastic. Supports shall be provided in sufficient number and spaced to provide the required clearances. Supports shall adequately support the reinforcement bars, and shall permit the concrete to flow through and fully encase the reinforcement. The legs of supports shall be spaced to allow an opening that is a minimum 1.33 times the nominal maximum aggregate size used in the concrete. Nominal maximum aggregate size is defined as the largest sieve which retains any of the aggregate sample particles. All supports shall meet the approval of the Engineer.”

Revise the first sentence of the eighth paragraph of Article 508.05 of the Standard Specifications to read:

“Epoxy coated reinforcement bars shall be tied with plastic coated wire, epoxy coated wire, or molded plastic clips where allowed.”

Add the following sentence to the end of the first paragraph of Article 508.06(c) of the Standard Specifications:

“In addition, the total slip of the bars within the splice sleeve of the connector after loading in tension to 30 ksi (207 MPa) and relaxing to 3 ksi (20.7 MPa) shall not exceed 0.01 in. (254 microns).”

Revise Article 1042.03(d) of the Standard Specifications to read:

“(d) Reinforcement and Accessories: The concrete cover over all reinforcement shall be within  $\pm 1/4$  in. ( $\pm 6$  mm) of the specified cover.

Welded wire fabric shall be accurately bent and tied in place.

Miscellaneous accessories to be cast into the concrete or for forming holes and recesses shall be carefully located and rigidly held in place by bolts, clamps, or other effective means. If paper tubes are used for vertical dowel holes, or other vertical holes which require grouting, they shall be removed before transportation to the construction site.”

## **REMOVAL AND DISPOSAL OF REGULATED SUBSTANCES (BDE)**

Effective: January 1, 2012

Revised: November 2, 2012

Revise Article 669.01 of the Standard Specifications to read:

“**669.01 Description.** This work shall consist of the transportation and proper disposal of contaminated soil and water. This work shall also consist of the removal, transportation, and proper disposal of underground storage tanks (UST), their content and associated underground piping to the point where the piping is above the ground, including determining the content types and estimated quantities.”

Revise Article 669.08 of the Standard Specifications to read:

“**669.08 Contaminated Soil and/or Groundwater Monitoring.** The Contractor shall hire a qualified environmental firm to monitor the area containing the regulated substances. The affected area shall be monitored with a photoionization detector (PID) utilizing a lamp of 10.6eV or greater or a flame ionization detector (FID). Any field screen reading on the PID or FID in excess of background levels indicates the potential presence of contaminated material requiring handling as a non-special waste, special waste, or hazardous waste. No excavated soils can be taken to a clean construction and demolition debris (CCDD) facility or an uncontaminated soil fill operation with detectable PID or FID meter readings that are above background. The PID or FID meter shall be calibrated on-site and background level readings taken and recorded daily. All testing shall be done by a qualified engineer/technician. Such testing and monitoring shall be included in the work. The Contractor shall identify the exact limits of removal of non-special waste, special waste, or hazardous waste. All limits shall be approved by the Engineer prior to excavation. The Contractor shall take all necessary precautions.

Based upon the land use history of the subject property and/or PID or FID readings indicating contamination, a soil or groundwater sample shall be taken from the same location and submitted to an approved laboratory. Soil or groundwater samples shall be analyzed for the contaminants of concern, including pH, based on the property's land use history or the parameters listed in the maximum allowable concentration (MAC) for chemical constituents in uncontaminated soil established pursuant to Subpart F of 35 Illinois Administrative Code 1100.605. The analytical results shall serve to document the level of soil contamination. Soil and groundwater samples may be required at the discretion of the Engineer to verify the level of soil and groundwater contamination.

Samples shall be grab samples (not combined with other locations). The samples shall be taken with decontaminated or disposable instruments. The samples shall be placed in sealed containers and transported in an insulated container to the laboratory. The container shall maintain a temperature of 39 °F (4 °C). All samples shall be clearly labeled. The labels shall indicate the sample number, date sampled, location and elevation, and any other observations.

The laboratory shall use analytical methods which are able to meet the lowest appropriate practical quantitation limits (PQL) or estimated quantitation limit (EQL) specified in "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods", EPA Publication No. SW-846 and "Methods for the Determination of Organic Compounds in Drinking Water", EPA, EMSL, EPA-600/4-88/039. For parameters where the specified cleanup objective is below the acceptable detection limit (ADL), the ADL shall serve as the cleanup objective. For other parameters the ADL shall be equal to or below the specified cleanup objective."

Replace the first two paragraphs of Article 669.09 of the Standard Specifications with the following:

**“669.09 Contaminated Soil and/or Groundwater Management and Disposal.** The management and disposal of contaminated soil and/or groundwater shall be according to the following:

- (a) Soil Analytical Results Exceed Most Stringent MAC. When the soil analytical results indicate that detected levels exceed the most stringent maximum allowable concentration (MAC) for chemical constituents in uncontaminated soil established pursuant to Subpart F of 35 Illinois Administrative Code 1100.605, the soil shall be managed as follows:
- (1) When analytical results indicate inorganic chemical constituents exceed the most stringent MAC but they are still considered within area background levels by the Engineer, the excavated soil can be utilized within the construction limits as fill, when suitable. Such soil excavated for storm sewers can be placed back into the excavated trench as backfill, when suitable, unless trench backfill is specified. If the soils cannot be utilized within the construction limits, they shall be managed and disposed of off-site as a non-special waste, special waste, or hazardous waste as applicable.
  - (2) When analytical results indicate chemical constituents exceed the most stringent MAC but do not exceed the MAC for a Metropolitan Statistical Area (MSA) County, the excavated soil can be utilized within the construction limits as fill, when suitable, or managed and disposed of off-site as "uncontaminated soil" at a CCDD facility or an uncontaminated soil fill operation within an MSA County provided the pH of the soil is within the range of 6.25 - 9.0, inclusive.
  - (3) When analytical results indicate chemical constituents exceed the most stringent MAC but do not exceed the MAC for an MSA County excluding Chicago, or the MAC within the Chicago corporate limits, the excavated soil can be utilized within the construction limits as fill, when suitable, or managed and disposed of off-site as "uncontaminated soil" at a CCDD facility or an uncontaminated soil fill operation within an MSA County excluding Chicago or within the Chicago corporate limits provided the pH of the soil is within the range of 6.25 - 9.0, inclusive.

- (4) When analytical results indicate chemical constituents exceed the most stringent MAC but do not exceed the MAC for an MSA County excluding Chicago, the excavated soil can be utilized within the construction limits as fill, when suitable, or managed and disposed of off-site as “uncontaminated soil” at a CCDD facility or an uncontaminated soil fill operation within an MSA County excluding Chicago provided the pH of the soil is within the range of 6.25 - 9.0, inclusive.
- (5) When the Engineer determines soil cannot be managed according to Articles 669.09(a)(1) through (a)(4) above, the soil shall be managed and disposed of off-site as a non-special waste, special waste, or hazardous waste as applicable.
- (b) Soil Analytical Results Do Not Exceed Most Stringent MAC. When the soil analytical results indicate that detected levels do not exceed the most stringent MAC but the pH of the soil is less than 6.25 or greater than 9.0, the excavated soil can be utilized within the construction limits or managed and disposed of off-site as “uncontaminated soil” according to Article 202.03. However the excavated soil cannot be taken to a CCDD facility or an uncontaminated soil fill operation.
- (c) Groundwater. When groundwater analytical results indicate the detected levels are above Appendix B, Table E of 35 Illinois Administrative Code 742, the most stringent Tier 1 Groundwater Remediation Objectives for Groundwater Component of the Groundwater Ingestion Route for Class 1 groundwater, the groundwater shall be managed off-site as a special waste.

All groundwater encountered within lateral trenches may be managed within the trench and allowed to infiltrate back into the ground. If the groundwater cannot be managed within the trench it must be removed as a special or hazardous waste. The Contractor is prohibited from managing groundwater within the trench by discharging it through any existing or new storm sewer. The Contractor shall install backfill plugs within the area of groundwater contamination.

One backfill plug shall be placed down gradient to the area of groundwater contamination. Backfill plugs shall be installed at intervals not to exceed 50 ft (15 m). Backfill plugs are to be 4 ft (1.2 m) long, measured parallel to the trench, full trench width and depth. Backfill plugs shall not have any fine aggregate bedding or backfill, but shall be entirely cohesive soil or any class of concrete. The Contractor shall provide test data that the material has a permeability of less than  $10^{-7}$  cm/sec according to ASTM D 5084, Method A or per another test method approved by the Engineer.”

Revise Article 669.14 of the Standard Specifications to read:

**“669.14 Final Environmental Construction Report.** At the end of the project, the Contractor will prepare and submit three copies of the Environmental Construction Report on the activities conducted during the life of the project, one copy shall be submitted to the Resident Engineer, one copy shall be submitted to the District's Environmental Studies Unit, and one copy shall be submitted with an electronic copy in Adode.pdf format to the Geologic and Waste Assessment Unit, Bureau of Design and Environment, IDOT, 2300 South Dirksen Parkway, Springfield, Illinois 62764. The technical report shall include all pertinent information regarding the project including, but not limited to:

- (a) Measures taken to identify, monitor, handle, and dispose of soil or groundwater containing regulated substances, to prevent further migration of regulated substances, and to protect workers,
- (b) Cost of identifying, monitoring, handling, and disposing of soil or groundwater containing regulated substances, the cost of preventing further migration of regulated substances, and the cost for worker protection from the regulated substances. All cost should be in the format of the contract pay items listed in the contract plans (identified by the preliminary environmental site investigation (PESA) site number),
- (c) Plan sheets showing the areas containing the regulated substances,
- (d) Field sampling and testing results used to identify the nature and extent of the regulated substances,

- (e) Waste manifests (identified by the preliminary environmental site investigation (PESA) site number) for special or hazardous waste disposal, and
- (f) Landfill tickets (identified by the preliminary environmental site investigation (PESA) site number) for non-special waste disposal.”

Revise the second paragraph of Article 669.16 of the Standard Specifications to read:

“The transportation and disposal of soil and other materials from an excavation determined to be contaminated will be paid for at the contract unit price per cubic yard (cubic meter) for NON-SPECIAL WASTE DISPOSAL, SPECIAL WASTE DISPOSAL, or HAZARDOUS WASTE DISPOSAL.”

## REMOVAL AND DISPOSAL OF SURPLUS MATERIALS (BDE)

Effective: November 2, 2012

Revise the first four paragraphs of Article 202.03 of the Standard Specifications to read:

**“202.03 Removal and Disposal of Surplus, Unstable, Unsuitable, and Organic Materials.** Suitable excavated materials shall not be wasted without permission of the Engineer. The Contractor shall dispose of all surplus, unstable, unsuitable, and organic materials, in such a manner that public or private property will not be damaged or endangered.

Suitable earth, stones and boulders naturally occurring within the right-of-way may be placed in fills or embankments in lifts and compacted according to Section 205. Broken concrete without protruding metal bars, bricks, rock, stone, reclaimed asphalt pavement with no expansive aggregate, or uncontaminated dirt and sand generated from construction or demolition activities may be used in embankment or in fill. If used in fills or embankments, these materials shall be placed and compacted to the satisfaction of the Engineer; shall be buried under a minimum of 2 ft (600 mm) of earth cover (except when the materials include only uncontaminated dirt); and shall not create an unsightly appearance or detract from the natural topographic features of an area. Broken concrete without protruding metal bars, bricks, rock, or stone may be used as riprap as approved by the Engineer. If the materials are used for fill in locations within the right-of-way but outside project construction limits, the Contractor must specify to the Engineer, in writing, how the landscape restoration of the fill areas will be accomplished. Placement of fill in such areas shall not commence until the Contractor’s landscape restoration plan is approved by the Engineer.

Aside from the materials listed above, all other construction and demolition debris or waste shall be disposed of in a licensed landfill, recycled, reused, or otherwise disposed of as allowed by State or Federal laws and regulations. When the Contractor chooses to dispose of uncontaminated soil at a clean construction and demolition debris (CCDD) facility or at an uncontaminated soil fill operation, it shall be the Contractor’s responsibility to have the pH of the material tested to ensure the value is between 6.25 and 9.0, inclusive. A copy of the pH test results shall be provided to the Engineer.

A permit shall be obtained from IEPA and made available to the Engineer prior to open burning of organic materials (i.e., plant refuse resulting from pruning or removal of trees or shrubs) or other construction or demolition debris. Organic materials originating within the right-of-way limits may be chipped or shredded and placed as mulch around landscape plantings within the right-of-way when approved by the Engineer. Chipped or shredded material to be placed as mulch shall not exceed a depth of 6 in. (150 mm).”



## **SUBCONTRACTOR MOBILIZATION PAYMENTS (BDE)**

Effective: April 2, 2005

Revised: April 1, 2011

To account for the preparatory work and operations necessary for the movement of subcontractor personnel, equipment, supplies, and incidentals to the project site and for all other work or operations that must be performed or costs incurred when beginning work approved for subcontracting according to Article 108.01 of the Standard Specifications, the Contractor shall make a mobilization payment to each subcontractor.

This mobilization payment shall be made at least 14 days prior to the subcontractor starting work. The amount paid shall be equal to 3 percent of the amount of the subcontract reported on form BC 260A submitted for the approval of the subcontractor's work.

The mobilization payment to the subcontractor is an advance payment of the reported amount of the subcontract and is not a payment in addition to the amount of the subcontract; therefore, the amount of the advance payment will be deducted from future progress payments.

This provision shall be incorporated directly or by reference into each subcontract approved by the Department.

## **TEMPORARY EROSION AND SEDIMENT CONTROL (BDE)**

Effective: January 1, 2012

Revise the first paragraph of Article 280.04(f) of the Standard Specifications to read:

“(f) Temporary Erosion Control Seeding. This system consists of seeding all erodible/bare areas to minimize the amount of exposed surface area. Seed bed preparation will not be required if the surface of the soil is uniformly smooth and in a loose condition. Light disking shall be done if the soil is hard packed or caked. Erosion rills greater than 1 in. (25 mm) in depth shall be filled and area blended with the surrounding soil. Fertilizer nutrients will not be required.”

Delete the last sentence of Article 280.08(e) of the Standard Specifications.

### **TRACKING THE USE OF PESTICIDES (BDE)**

Effective: August 1, 2012

Add the following paragraph after the first paragraph of Article 107.23 of the Standard Specifications:

“Within 48 hours of the application of pesticides, including but not limited to herbicides, insecticides, algacides, and fungicides, the Contractor shall complete and return to the Engineer, Operations form “OPER 2720”.”

### **TRAFFIC CONTROL DEFICIENCY DEDUCTION (BDE)**

Effective: August 1, 2011

Revise the third sentence of the third paragraph of Article 105.03(b) of the Standard Specifications to read:

“The daily monetary deduction will be \$2,500.”

### **TRAINING SPECIAL PROVISIONS (BDE)**

Effective: October 15, 1975

This Training Special Provision supersedes Section 7b of the Special Provision entitled “Specific Equal Employment Opportunity Responsibilities,” and is in implementation of 23 U.S.C. 140(a).

As part of the Contractor’s equal employment opportunity affirmative action program, training shall be provided as follows:

The Contractor shall provide on-the-job training aimed at developing full journeyman in the type of trade or job classification involved. The number of trainees to be trained under this contract will be 3. In the event the Contractor subcontracts a portion of the contract work, he shall determine how many, if any, of the trainees are to be trained by the subcontractor, provided however, that the Contractor shall retain the primary responsibility for meeting the training requirements imposed by this special provision. The Contractor shall also insure that this Training Special Provision is made applicable to such subcontract. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training.

The number of trainees shall be distributed among the work classifications on the basis of the Contractor's needs and the availability of journeymen in the various classifications within the reasonable area of recruitment. Prior to commencing construction, the Contractor shall submit to the Illinois Department of Transportation for approval the number of trainees to be trained in each selected classification and training program to be used. Furthermore, the Contractor shall specify the starting time for training in each of the classifications. The Contractor will be credited for each trainee employed by him on the contract work who is currently enrolled or becomes enrolled in an approved program and will be reimbursed for such trainees as provided hereinafter.

Training and upgrading of minorities and women toward journeyman status is a primary objective of this Training Special Provision. Accordingly, the Contractor shall make every effort to enroll minority trainees and women (e.g. by conducting systematic and direct recruitment through public and private sources likely to yield minority and women trainees) to the extent such persons are available within a reasonable area of recruitment. The Contractor will be responsible for demonstrating the steps that he has taken in pursuance thereof, prior to a determination as to whether the Contractor is in compliance with this Training Special Provision. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training, whether a member of a minority group or not.

No employee shall be employed as a trainee in any classification in which he has successfully completed a training course leading to journeyman status or in which he has been employed as a journeyman. The Contractor should satisfy this requirement by including appropriate questions in the employee application or by other suitable means. Regardless of the method used, the Contractor's records should document the findings in each case.

The minimum length and type of training for each classification will be as established in the training program selected by the Contractor and approved by the Illinois Department of Transportation and the Federal Highway Administration. The Illinois Department of Transportation and the Federal Highway Administration shall approve a program, if it is reasonably calculated to meet the equal employment opportunity obligations of the Contractor and to qualify the average trainee for journeyman status in the classification concerned by the end of the training period. Furthermore, apprenticeship programs registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau and training programs approved by not necessarily sponsored by the U.S. Department of Labor, Manpower Administration, Bureau of Apprenticeship and Training shall also be considered acceptable provided it is being administered in a manner consistent with the equal employment obligations of Federal-aid highway construction contracts. Approval or acceptance of a training program shall be obtained from the State prior to commencing work on the classification covered by the program. It is the intention of these provisions that training is to be provided in the construction crafts rather than clerk-typists or secretarial-type positions. Training is permissible in lower level management positions such as office engineers, estimators, timekeepers, etc., where the training is oriented toward construction applications. Training in the laborer classification may be permitted provided that significant and meaningful training is provided and approved by the Illinois Department of Transportation and the Federal Highway Administration. Some offsite training is permissible as long as the training is an integral part of an approved training program and does not comprise a significant part of the overall training.

Except as otherwise noted below, the Contractor will be reimbursed 80 cents per hour of training given an employee on this contract in accordance with an approved training program. As approved by the Engineer, reimbursement will be made for training of persons in excess of the number specified herein. This reimbursement will be made even though the Contractor receives additional training program funds from other sources, provided such other source does not specifically prohibit the Contractor from receiving other reimbursement. Reimbursement for offsite training indicated above may only be made to the Contractor where he does one or more of the following and the trainees are concurrently employed on a Federal-aid project; contributes to the cost of the training, provides the instruction to the trainee or pays the trainee's wages during the offsite training period.

No payment shall be made to the Contractor if either the failure to provide the required training, or the failure to hire the trainee as a journeyman, is caused by the Contractor and evidences a lack of good faith on the part of the Contractor in meeting the requirement of this Training Special Provision. It is normally expected that a trainee will begin his training on the project as soon as feasible after start of work utilizing the skill involved and remain on the project as long as training opportunities exist in his work classification or until he has completed his training program.

It is not required that all trainees be on board for the entire length of the contract. A Contractor will have fulfilled his responsibilities under this Training Special Provision if he has provided acceptable training to the number of trainees specified. The number trained shall be determined on the basis of the total number enrolled on the contract for a significant period.

Trainees will be paid at least 60 percent of the appropriate minimum journeyman's rate specified in the contract for the first half of the training period, 75 percent for the third quarter of the training period, and 90 percent for the last quarter of the training period, unless apprentices or trainees in an approved existing program are enrolled as trainees on this project. In that case, the appropriate rates approved by the Departments of Labor or Transportation in connection with the existing program shall apply to all trainees being trained for the same classification who are covered by this Training Special Provision.

The Contractor shall furnish the trainee a copy of the program he will follow in providing the training. The Contractor shall provide each trainee with a certification showing the type and length of training satisfactorily complete.

The Contractor shall provide for the maintenance of records and furnish periodic reports documenting his performance under this Training Special Provision.

Method of Measurement. The unit of measurement is in hours.

Basis of Payment. This work will be paid for at the contract unit price of 80 cents per hour for TRAINEES. The estimated total number of hours, unit price, and total price have been included in the schedule of prices.

### **IDOT TRAINING PROGRAM GRADUATE ON-THE-JOB TRAINING SPECIAL PROVISION (TPG)**

Effective: August 1, 2012

In addition to the Contractor's equal employment opportunity affirmative action efforts undertaken as elsewhere required by this Contract, the Contractor is encouraged to participate in the incentive program to provide additional on-the-job training to certified graduates of IDOT's community college pre-apprenticeship programs outlined by this Special Provision.

It is the policy of IDOT to fund IDOT pre-apprenticeship training programs based at Illinois Community Colleges throughout Illinois, by Intergovernmental Agreement with the Illinois Community College Board, to provide training and skill-improvement opportunities to assure the increased participation of minority groups, disadvantaged persons and women in all phases of the highway construction industry. The intent of this IDOT Training Program Graduate (TPG) Special Provision is to place certified graduates of these IDOT funded pre-apprentice training programs on IDOT project sites when feasible, and provide the graduates with meaningful on-the-job training intended to lead to journey-level employment. IDOT and its sub-recipients, in carrying out the responsibilities of a state contract, shall determine which state funded construction contracts shall include "Training Program Graduate (TPG) Special Provisions." To benefit from the incentives to encourage the participation in the additional on-the-job training under this Training Program Graduate (TPG) Special Provision, the Contractor shall make every reasonable effort to employ certified graduates of the IDOT funded Pre-apprenticeship Training Program to the extent such persons are available within a reasonable recruitment area.

Participation pursuant to IDOT's requirements by the Contractor or subcontractor in this Training Program Graduate (TPG) Special Provision entitles the Contractor or subcontractor to be reimbursed at \$10.00 per hour for training given a certified graduate trainee on this contract. As approved by the Department, reimbursement will be made for training persons as specified herein. This reimbursement will be made even though the Contractor or subcontractor may receive additional training program funds from other sources for other trainees, provided such other source does not specifically prohibit the Contractor or subcontractor from receiving other reimbursement. For purposes of this Special Provision the Contractor is not relieved of requirements under the Illinois Prevailing Wage Act and is not eligible for other training fund reimbursements in addition to the Training Program Graduate (TPG) Special Provision reimbursement.

No payment shall be made to the Contractor if the Contractor or subcontractor fails to provide the required training. It is normally expected that a TPG will begin training on the project as soon as feasible after start of work utilizing the skill involved and remain on the project through completion of the contract, so long as training opportunities exist in his work classification or until he has completed his training program. Should the TPG's employment end in advance of the completion of the contract, the Contractor shall promptly notify the designated IDOT staff member under this Special Provision that the TPG's involvement in the contract has ended and supply a written report of the reason for the end of the involvement, the hours completed by the TPG under the Contract and the number of hours for which the incentive payment provided under this Special Provision will be or has been claimed for the TPG.

The Contractor will provide for the maintenance of records and furnish periodic reports documenting its performance under this Special Provision.

**METHOD OF MEASUREMENT:** The unit of measurement is in hours.

**BASIS OF PAYMENT:** This work will be paid for at the contract unit price of \$10.00 per hour for TRAINEES TRAINING PROGRAM GRADUATE. The estimated total number of hours, unit price and total price have been included in the schedule of prices.

The Contractor shall provide training opportunities aimed at developing full journeyworker in the type of trade or job classification involved. The initial number of TPGs for which the incentive is available under this contract is 3. During the course of performance of the Contract the Contractor may seek approval from the Department for additional incentive eligible TPGs. In the event the Contractor subcontracts a portion of the contract work, it shall determine how many, if any, of the TPGs are to be trained by the subcontractor, provided however, that the Contractor shall retain the primary responsibility for meeting the training requirements imposed by this Special Provision. The Contractor shall also insure that this Training Program Graduate Special Provision is made applicable to such subcontract if the TPGs are to be trained by a subcontractor and that the incentive payment is passed on to each subcontractor.

For the Contractor to meet the obligations for participation in this TPG incentive program under this Special Provision, the Department has contracted by Intergovernmental Agreement with the Illinois Community College Board to provide screening, tutoring and pre-training to individuals interested in working in the applicable construction classification and has certified those students who have successfully completed the program and are eligible to be TPGs. A designated IDOT staff member, the Director of the Office of Business and Workforce Diversity (OBWD), will be responsible for providing assistance and referrals to the Contractor for the applicable TPGs. For this contract, the Director of OBWD is designated as the responsible IDOT staff member to provide the assistance and referral services related to the placement for this Special Provision. For purposes of this Contract, contacting the Director of OBWD and interviewing each candidate he/she recommends constitutes reasonable recruitment.

Prior to commencing construction, the Contractor shall submit to the Department for approval the TPGs to be trained in each selected classification. Furthermore, the Contractor shall specify the starting time for training in each of the classifications. No employee shall be employed as a TPG in any classification in which he/she has successfully completed a training course leading to journeyman status or in which he/she has been employed as a journeyman. Notwithstanding the on-the-job training purpose of this TPG Special Provision, some offsite training is permissible as long as the offsite training is an integral part of the work of the contract and does not comprise a significant part of the overall training.

Training and upgrading of TPGs of IDOT pre-apprentice training programs is intended to move said TPGs toward journeyman status and is the primary objective of this Training Program Graduate Special Provision. Accordingly, the Contractor shall make every effort to enroll TPGs by recruitment through the IDOT Illinois Community College Program to the extent such persons are available within a reasonable area of recruitment. The Contractor will be responsible for demonstrating the steps that it has taken in pursuance thereof, prior to a determination as to whether the Contractor is in compliance and entitled to the Training Program Graduate TPG Special Provision \$10.00 an hour incentive.

The Contractor or subcontractor shall provide each TPG with a certification showing the type and length of training satisfactorily completed.

#### **UTILITY COORDINATION AND CONFLICTS (BDE)**

Effective: April 1, 2011

Revised: January 1, 2012

Revise Article 105.07 of the Standard Specifications to read:

**“105.07 Cooperation with Utilities.** The Department reserves the right at any time to allow work by utilities on or near the work covered by the contract. The Contractor shall conduct his/her work so as not to interfere with or hinder the progress or completion of the work being performed by utilities. The Contractor shall also arrange the work and shall place and dispose of the materials being used so as not to interfere with the operations of utility work in the area.

The Contractor shall cooperate with the owners of utilities in their removal and rearrangement operations so work may progress in a reasonable manner, duplication or rearrangement of work may be reduced to a minimum, and services rendered by those parties will not be unnecessarily interrupted.

The Contractor shall coordinate with any planned utility adjustment or new installation and the Contractor shall take all precautions to prevent disturbance or damage to utility facilities. Any failure on the part of the utility owner, or their representative, to proceed with any planned utility adjustment or new installation shall be reported promptly by the Contractor to the Engineer.”

Revise the first sentence of the last paragraph of Article 107.19 of the Standard Specifications to read:

“When the Contractor encounters unexpected regulated substances due to the presence of utilities in unanticipated locations, the provisions of Article 107.40 shall apply; otherwise, if the Engineer does not direct a resumption of operations, the provisions of Article 108.07 shall apply.”

Revise Article 107.31 of the Standard Specification to read:

**“107.31 Reserved.”**

Add the following four Articles to Section 107 of the Standard Specifications:

**“107.37 Locations of Utilities within the Project Limits.** All known utilities existing within the limits of construction are either indicated on the plans or visible above ground. For the purpose of this Article, the limits of proposed construction are defined as follows:

(a) Limits of Proposed Construction for Utilities Paralleling the Roadway.

- (1) The horizontal limits shall be a vertical plane, outside of, parallel to, and 2 ft (600 mm) distant at right angles from the plan or revised slope limits.

In cases where the limits of excavation for structures are not shown on the plans, the horizontal limits shall be a vertical plane 4 ft (1.2 m) outside the edges of structure footings or the structure where no footings are required.

- (2) The upper vertical limits shall be the regulations governing the roadbed clearance for the specific utility involved.
- (3) The lower vertical limits shall be either the top of the utility at the depth below the proposed grade as prescribed by the governing agency or the limits of excavation, whichever is less.



(b) Limits of Proposed Construction for Utilities Crossing the Roadway in a Generally Transverse Direction.

- (1) Utilities crossing excavations for structures that are normally made by trenching such as sewers, underdrains, etc. and all minor structures such as manholes, inlets, foundations for signs, foundations for traffic signals, etc., the limits shall be the space to be occupied by the proposed permanent construction, unless otherwise required by the regulations governing the specific utility involved.
- (2) For utilities crossing the proposed site of major structures such as bridges, sign trusses, etc., the limits shall be as defined above for utilities extending in the same general direction as the roadway.

It is understood and agreed that the Contractor has considered in the bid all of the permanent and temporary utilities in their present and/or adjusted positions as indicated in the contract. It is further understood the actual location of the utilities may be located anywhere within the tolerances provided in 220 ILCS 50/2.8 or Administrative Code Title 92 Part 530.40(c), and the proximity of some utilities to construction may require extraordinary measures by the Contractor to protect those utilities.

No additional compensation will be allowed for any delays, inconveniences, or damages sustained by the Contractor due to the presence of or any claimed interference from known utility facilities or any adjustment of them, except as specifically provided in the contract.

**107.38 Adjustments of Utilities within the Project Limits.** The adjustment of utilities consists of the relocation, removal, replacement, rearrangements, reconstruction, improvement, disconnection, connection, shifting, new installation, or altering of an existing utility facility in any manner.

Utilities which are to be adjusted shall be adjusted by the utility owner or the owner's representative or by the Contractor as a contract item. Generally, arrangements for adjusting known utilities will be made by the Department prior to project construction; however, utilities will not necessarily be adjusted in advance of project construction and, in some cases, utilities will not be removed from the proposed construction limits as described in Article 107.37. When utility adjustments must be performed in conjunction with construction, the utility adjustment work will be indicated in the contract.

The Contractor may make arrangements for adjustment of utilities indicated in the contract, but not scheduled by the Department for adjustment, provided the Contractor furnishes the Department with a signed agreement with the utility owner covering the adjustments to be made. The cost of any such adjustments shall be the responsibility of the Contractor.

**107.39 Contractor’s Responsibility for Locating and Protecting Utility Property and Services.** At points where the Contractor’s operations are adjacent to properties or facilities of utility companies, or are adjacent to other property, damage to which might result in considerable expense, loss, or inconvenience, work shall not be commenced until all arrangements necessary for the protection thereof have been made.

Within the State of Illinois, a State-Wide One Call Notice System has been established for notifying utilities. Outside the city limits of the City of Chicago, the system is known as the Joint Utility Locating Information for Excavators (JULIE) System. Within the city limits of the City of Chicago the system is known as DIGGER. All utility companies and municipalities which have buried utility facilities in the State of Illinois are a part of this system.

The Contractor shall call JULIE (800-892-0123) or DIGGER (312-744-7000), a minimum of 48 hours in advance of work being done in the area, and they will notify all member utility companies involved their respective utility should be located.

For utilities which are not members of JULIE or DIGGER, the Contractor shall contact the owners directly. The plan general notes will indicate which utilities are not members of JULIE or DIGGER.

The following table indicates the color of markings required of the State-Wide One Call Notification System.

<b>Utility Service</b>	<b>Color</b>
Electric Power, Distribution and Transmission	Safety Red
Municipal Electric Systems	Safety Red
Gas Distribution and Transmission	High Visibility Safety Yellow
Oil Distribution and Transmission	High Visibility Safety Yellow
Telephone and Telegraph System	Safety Alert Orange
Community Antenna Television Systems	Safety Alert Orange
Water Systems	Safety Precaution Blue
Sewer Systems	Safety Green
Non-Potable Water and Slurry Lines	Safety Purple
Temporary Survey	Safety Pink
Proposed Excavation	Safety White (Black when snow is on the ground)

The State-Wide One Call Notification System will provide for horizontal locations of utilities. When it is determined that the vertical location of the utility is necessary to facilitate construction, the Engineer may make the request for location from the utility after receipt of notice from the Contractor. If the utility owner does not field locate their facilities to the satisfaction of the Engineer, the Engineer will authorize the Contractor in writing to proceed to locate the facilities in the most economical and reasonable manner, subject to the approval of the Engineer, and be paid according to Article 109.04.

The Contractor shall be responsible for maintaining the excavations or markers provided by the utility owners.

The Contractor shall take all necessary precautions for the protection of the utility facilities. The Contractor shall be responsible for any damage or destruction of utility facilities resulting from neglect, misconduct, or omission in the Contractor's manner or method of execution or nonexecution of the work, or caused by defective work or the use of unsatisfactory materials. Whenever any damage or destruction of a utility facility occurs as a result of work performed by the Contractor, the utility company will be immediately notified. The utility company will make arrangements to restore such facility to a condition equal to that existing before any such damage or destruction was done.

In the event of interruption of utility services as a result of accidental breakage or as a result of being exposed or unsupported, the Contractor shall promptly notify the proper authority and shall cooperate with the said authority in the restoration of service. If water service is interrupted, repair work shall be continuous until the service is restored. No work shall be undertaken around fire hydrants until provisions for continued service have been approved by the local fire authority.

**107.40 Conflicts with Utilities.** Except as provided hereinafter, the discovery of a utility in an unanticipated location will be evaluated according to Article 104.03. It is understood and agreed that the Contractor has considered in the bid all facilities not meeting the definition of a utility in an unanticipated location and no additional compensation will be allowed for any delays, inconveniences, or damages sustained by the Contractor due to the presence of or any claimed interference from such facilities.

When the Contractor discovers a utility in an unanticipated location, the Contractor shall not interfere with said utility, shall take proper precautions to prevent damage or interruption of the utility, and shall promptly notify the Engineer of the nature and location of said utility.

(a) Definition. A utility in an unanticipated location is defined as an active or inactive utility, which is either:

(1) Located underground and (a) not shown in any way in any location on the contract documents; (b) not identified in writing by the Department to the Contractor prior to the letting; or (c) not located relative to the location shown in the contract within the tolerances provided in 220 ILCS 50/2.8 or Administrative Code Title 92 Part 530.40(c); or

(2) Located above ground or underground and not relocated as provided in the contract.

Service connections shall not be considered to be utilities in unanticipated locations.

(b) Compensation. Compensation will not be allowed for delays, inconveniences, or damages sustained by the Contractor from conflicts with facilities not meeting the above definition; or if a conflict with a utility in an unanticipated location does not cause a shutdown of the work applicable to the utility or a documentable reduction in the rate of progress exceeding the limits set herein. The provisions of Article 104.03 notwithstanding, compensation for delays caused by a utility in an unanticipated location will be paid according to the provisions of this Article governing minor and major delays or reduced rate of production which are defined as follows:

- (1) Minor Delay. A minor delay occurs when the Contractor's operation is completely stopped by a utility in an unanticipated location for more than two hours, but not to exceed three weeks.
- (2) Major Delay. A major delay occurs when the Contractor's operation is completely stopped by a utility in an unanticipated location for more than three weeks.
- (3) Reduced Rate of Production Delay. A reduced rate of production delay occurs when the contractor's rate of production decreases by more than 25 percent and lasts longer than seven days.

(c) Payment. Payment for Minor, Major and Reduced Rate of Production Delays will be made as follows.

- (1) Minor Delay. Labor idled which cannot be used on other work will be paid for according to Article 109.04(b)(1) and (2) for the time between start of the delay and the minimum remaining hours in the work shift required by the prevailing practice in the area.

Equipment idled which cannot be used on other work, and which is authorized to standby on the project site by the Engineer, will be paid for according to Article 109.04(b)(4).

- (2) Major Delay. Labor will be the same as for a minor delay.

Equipment will be the same as for a minor delay, except Contractor-owned equipment will be limited to three weeks plus the cost of move-out to either the Contractor's yard or another job, whichever is less. Rental equipment may be paid for longer than three weeks provided the Contractor presents adequate support to the Department (including lease agreement) to show retaining equipment on the job is the most economical course to follow and in the public interest.

- (3) Reduced Rate of Production Delay. The Contractor will be compensated for the reduced productivity for labor and equipment time in excess of the 25 percent threshold for that portion of the delay in excess of seven days. Determination of compensation will be in accordance with Article 104.02, except labor and material additives will not be permitted.

Whether covered by (1), (2) or (3) above, additional traffic control required as a result of the operation(s) delayed will be paid for according to Article 109.04 for the total length of the delay.

If the delay is clearly shown to have caused work, which would have otherwise been completed, to be done after material or labor costs have increased, such increases may be paid. Payment for materials will be limited to increased cost substantiated by documentation furnished by the Contractor. Payment for increased labor rates will include those items in Article 109.04(b)(1) and (2), except the 35 percent and ten percent additives will not be permitted. On a working day contract, a delay occurring between November 30 and May 1, when work has not started, will not be considered as eligible for payment of measured labor and material costs.

Project overhead (not including interest) will be allowed when all progress on the contract has been delayed, and will be calculated as 15 percent of the delay claim.

- (d) Other Obligations of Contractor. Upon payment of a claim under this provision, the Contractor shall assign subrogation rights to the Department for the Department's efforts of recovery from any other party for monies paid by the Department as a result of any claim under this Provision. The Contractor shall fully cooperate with the Department in its efforts to recover from another party any money paid to the Contractor for delay damages under this Provision."

### **WARM MIX ASPHALT (BDE)**

Effective: January 1, 2012  
Revised: November 1, 2013

Description. This work shall consist of designing, producing and constructing Warm Mix Asphalt (WMA) in lieu of Hot Mix Asphalt (HMA) at the Contractor's option. Work shall be according to Sections 406, 407, 408, 1030, and 1102 of the Standard Specifications, except as modified herein. In addition, any references to HMA in the Standard Specifications, or the special provisions shall be construed to include WMA.

WMA is an asphalt mixture which can be produced at temperatures lower than allowed for HMA utilizing approved WMA technologies. WMA technologies are defined as the use of additives or processes which allow a reduction in the temperatures at which HMA mixes are produced and placed. WMA is produced by the use of additives, a water foaming process, or combination of both. Additives include minerals, chemicals or organics incorporated into the asphalt binder stream in a dedicated delivery system. The process of foaming injects water into the asphalt binder stream, just prior to incorporation of the asphalt binder with the aggregate.

Approved WMA technologies may also be used in HMA provided all the requirements specified herein, with the exception of temperature, are met. However, asphalt mixtures produced at temperatures in excess of 275 °F (135 °C) will not be considered WMA when determining the grade reduction of the virgin asphalt binder grade.

#### Materials.

Add the following to Article 1030.02 of the Standard Specifications.

“(h) Warm Mix Asphalt (WMA) Technologies (Note 3)”

Add the following note to Article 1030.02 of the Standard Specifications.

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

#### Equipment.

Revise the first paragraph of Article 1102.01 of the Standard Specifications to read:

**“1102.01 Hot-Mix Asphalt Plant.** The hot-mix asphalt (HMA) plant shall be the batch-type, continuous-type, or dryer drum plant. The plants shall be evaluated for prequalification rating and approval to produce HMA according to the current Bureau of Materials and Physical Research Policy Memorandum, “Approval of Hot-Mix Asphalt Plants and Equipment”. Once approved, the Contractor shall notify the Bureau of Materials and Physical Research to obtain approval of all plant modifications. The plants shall not be used to produce mixtures concurrently for more than one project or for private work unless permission is granted in writing by the Engineer. The plant units shall be so designed, coordinated and operated that they will function properly and produce HMA having uniform temperatures and compositions within the tolerances specified. The plant units shall meet the following requirements.”

Add the following to Article 1102.01(a) of the Standard Specifications.

“(13) Equipment for Warm Mix Technologies.

- a. Foaming. Metering equipment for foamed asphalt shall have an accuracy of  $\pm 2$  percent of the actual water metered. The foaming control system shall be electronically interfaced with the asphalt binder meter.
- b. Additives. Additives shall be introduced into the plant according to the supplier’s recommendations and shall be approved by the Engineer. The system for introducing the WMA additive shall be interlocked with the aggregate feed or weigh system to maintain correct proportions for all rates of production and batch sizes.”

Mix Design Verification.

Add the following to Article 1030.04 of the Standard Specifications.

“(e) Warm Mix Technologies.

- (1) Foaming. WMA mix design verification will not be required when foaming technology is used alone (without WMA additives). However, the foaming technology shall only be used on HMA designs previously approved by the Department.
- (2) Additives. WMA mix designs utilizing additives shall be submitted to the Engineer for mix design verification.

Production.

Revise the second paragraph of Article 1030.06(a) of the Standard Specifications to read:

“At the start of mix production for HMA, WMA, and HMA using WMA technologies, QC/QA mixture start-up will be required for the following situations; at the beginning of production of a new mixture design, at the beginning of each production season, and at every plant utilized to produce mixtures, regardless of the mix.”

Quality Control/Quality Assurance Testing.

Revise the table in Article 1030.05(d)(2)a. of the Standard Specifications to read:

Parameter	Frequency of Tests	Frequency of Tests	Test Method See Manual of Test Procedures for Materials
	High ESAL Mixture Low ESAL Mixture	All Other Mixtures	
Aggregate Gradation  % passing sieves: 1/2 in. (12.5 mm), No. 4 (4.75 mm), No. 8 (2.36 mm), No. 30 (600 μm) No. 200 (75 μm)  Note 1.	1 washed ignition oven test on the mix per half day of production  Note 4.	1 washed ignition oven test on the mix per day of production  Note 4.	Illinois Procedure
Asphalt Binder Content by Ignition Oven  Note 2.	1 per half day of production	1 per day	Illinois-Modified AASHTO T 308
VMA  Note 3.	Day's production ≥ 1200 tons:  1 per half day of production  Day's production < 1200 tons:  1 per half day of production for first 2 days and 1 per day thereafter (first sample of the day)	N/A	Illinois-Modified AASHTO R 35
Air Voids  Bulk Specific Gravity of Gyrotory Sample  Note 5.	Day's production ≥ 1200 tons:  1 per half day of production  Day's production < 1200 tons:  1 per half day of production for first 2 days and 1 per day thereafter (first sample of the day)	1 per day	Illinois-Modified AASHTO T 312
Maximum Specific Gravity of Mixture	Day's production ≥ 1200 tons:  1 per half day of production	1 per day	Illinois-Modified AASHTO T 209



Parameter	Frequency of Tests	Frequency of Tests	Test Method See Manual of Test Procedures for Materials
	High ESAL Mixture Low ESAL Mixture	All Other Mixtures	
	Day's production < 1200 tons:  1 per half day of production for first 2 days and 1 per day thereafter (first sample of the day)		

Note 1. The No. 8 (2.36 mm) and No. 30 (600 µm) sieves are not required for All Other Mixtures.

Note 2. The Engineer may waive the ignition oven requirement for asphalt binder content if the aggregates to be used are known to have ignition asphalt binder content calibration factors which exceed 1.5 percent. If the ignition oven requirement is waived, other Department approved methods shall be used to determine the asphalt binder content.

Note 3. The  $G_{sb}$  used in the voids in the mineral aggregate (VMA) calculation shall be the same average  $G_{sb}$  value listed in the mix design.

Note 4. The Engineer reserves the right to require additional hot bin gradations for batch

Note 5. The WMA compaction temperature for mixture volumetric testing shall be  $270 \pm 5$  °F ( $132 \pm 3$  °C) for quality control testing. The WMA compaction temperature for quality assurance testing will be  $270 \pm 5$  °F ( $132 \pm 3$  °C) if the mixture is not allowed to cool to room temperature. If the mixture is allowed to cool to room temperature it shall be reheated to standard HMA compaction temperatures.”

Construction Requirements.

Revise the second paragraph of Article 406.06(b)(1) of the Standard Specifications to read:

“The HMA shall be delivered at a temperature of 250 to 350 °F (120 to 175 °C).  
 WMA shall be delivered at a minimum temperature of 215 °F (102 °C).”

Basis of Payment.

This work will be paid at the contract unit price bid for the HMA pay items involved. Anti-strip will not be paid for separately, but shall be considered as included in the cost of the work.

## **WEEKLY DBE TRUCKING REPORTS (BDE)**

Effective: June 2, 2012

The Contractor shall provide a weekly report of Disadvantaged Business Enterprise (DBE) trucks hired by the Contractor or subcontractors (i.e. not owned by the Contractor or subcontractors) that are used on the jobsite; or used for the delivery and/or removal of equipment/material to and from the jobsite. The jobsite shall also include offsite locations, such as plant sites or storage sites, when those locations are used solely for this contract.

The report shall be submitted on the form provided by the Department within ten business days following the reporting period. The reporting period shall be Monday through Sunday for each week reportable trucking activities occur. The report shall be submitted to the Engineer and a copy shall be provided to the district EEO Officer.

Any costs associated with providing weekly DBE trucking reports shall be considered as included in the contract unit prices bid for the various items of work involved and no additional compensation will be allowed.

**BITUMINOUS MATERIALS COST ADJUSTMENTS (BDE) (RETURN FORM WITH BID)**

Effective: November 2, 2006

Revised: August 1, 2013

Description. Bituminous material cost adjustments will be made to provide additional compensation to the Contractor, or credit to the Department, for fluctuations in the cost of bituminous materials when optioned by the Contractor. The adjustments shall apply to permanent and temporary hot-mix asphalt (HMA) mixtures, bituminous surface treatments (cover and seal coats), and preventative maintenance type surface treatments. The adjustments shall not apply to bituminous prime coats, tack coats, crack filling/sealing, or joint filling/sealing.

The bidder shall indicate on the attached form whether or not this special provision will be part of the contract and submit the completed form with his/her bid. Failure to submit the form, or failure to fill out the form completely, shall make this contract exempt of bituminous materials cost adjustments.

Method of Adjustment. Bituminous materials cost adjustments will be computed as follows.

$$CA = (BPI_P - BPI_L) \times (\%AC_V / 100) \times Q$$

- Where: CA = Cost Adjustment, \$.  
BPI<sub>P</sub> = Bituminous Price Index, as published by the Department for the month the work is performed, \$/ton (\$/metric ton).  
BPI<sub>L</sub> = Bituminous Price Index, as published by the Department for the month prior to the letting, \$/ton (\$/metric ton).  
%AC<sub>V</sub> = Percent of virgin Asphalt Cement in the Quantity being adjusted. For HMA mixtures, the % AC<sub>V</sub> will be determined from the adjusted job mix formula. For bituminous materials applied, a performance graded or cutback asphalt will be considered to be 100% AC<sub>V</sub> and undiluted emulsified asphalt will be considered to be 65% AC<sub>V</sub>.  
Q = Authorized construction Quantity, tons (metric tons) (see below).

For HMA mixtures measured in square yards:  $Q, \text{ tons} = A \times D \times (G_{mb} \times 46.8) / 2000$ . For HMA mixtures measured in square meters:  $Q, \text{ metric tons} = A \times D \times (G_{mb} \times 1) / 1000$ . When computing adjustments for full-depth HMA pavement, separate calculations will be made for the binder and surface courses to account for their different  $G_{mb}$  and % AC<sub>V</sub>.

For bituminous materials measured in gallons:  $Q, \text{ tons} = V \times 8.33 \text{ lb/gal} \times \text{SG} / 2000$   
For bituminous materials measured in liters:  $Q, \text{ metric tons} = V \times 1.0 \text{ kg/L} \times \text{SG} / 1000$

Where: A = Area of the HMA mixture, sq yd (sq m).  
D = Depth of the HMA mixture, in. (mm).  
 $G_{mb}$  = Average bulk specific gravity of the mixture, from the approved mix design.  
V = Volume of the bituminous material, gal (L).  
SG = Specific Gravity of bituminous material as shown on the bill of lading.

Basis of Payment. Bituminous materials cost adjustments may be positive or negative but will only be made when there is a difference between the  $BPI_L$  and  $BPI_P$  in excess of five percent, as calculated by:

$$\text{Percent Difference} = \{(BPI_L - BPI_P) \div BPI_L\} \times 100$$

Bituminous materials cost adjustments will be calculated for each calendar month in which applicable bituminous material is placed; and will be paid or deducted when all other contract requirements for the work placed during the month are satisfied. The adjustments shall not apply during contract time subject to liquidated damages for completion of the entire contract.

Return With Bid

**ILLINOIS DEPARTMENT  
OF TRANSPORTATION**

**OPTION FOR  
BITUMINOUS MATERIALS COST ADJUSTMENTS**

The bidder shall submit this completed form with his/her bid. Failure to submit the form, or failure to fill out the form completely, shall make this contract exempt of bituminous materials cost adjustments. After award, this form, when submitted, shall become part of the contract.

**Contract No.:** \_\_\_\_\_

**Company Name:** \_\_\_\_\_

**Contractor's Option:**

Is your company opting to include this special provision as part of the contract?

Yes  No

**Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**STEEL COST ADJUSTMENT (BDE) (RETURN FORM WITH BID)**

Effective: April 2, 2004

Revised: April 1, 2009

Description. Steel cost adjustments will be made to provide additional compensation to the Contractor, or a credit to the Department, for fluctuations in steel prices when optioned by the Contractor. The bidder shall indicate on the attached form whether or not this special provision will be part of the contract and submit the completed form with his/her bid. Failure to submit the form or failure to indicate contract number, company name, and sign and date the form shall make this contract exempt of steel cost adjustments for all items of steel. Failure to indicate "Yes" for any item of work will make that item of steel exempt from steel cost adjustment.

Types of Steel Products. An adjustment will be made for fluctuations in the cost of steel used in the manufacture of the following items:

Metal Piling (excluding temporary sheet piling)  
Structural Steel  
Reinforcing Steel

Other steel materials such as dowel bars, tie bars, mesh reinforcement, guardrail, steel traffic signal and light poles, towers and mast arms, metal railings (excluding wire fence), and frames and grates will be subject to a steel cost adjustment when the pay items they are used in has a contract value of \$10,000 or greater.

Documentation. Sufficient documentation shall be furnished to the Engineer to verify the following:

- (a) The dates and quantity of steel, in lb (kg), shipped from the mill to the fabricator.
- (b) The quantity of steel, in lb (kg), incorporated into the various items of work covered by this special provision. The Department reserves the right to verify submitted quantities.

Method of Adjustment. Steel cost adjustments will be computed as follows:

$$SCA = Q \times D$$

Where: SCA = steel cost adjustment, in dollars  
Q = quantity of steel incorporated into the work, in lb (kg)  
D = price factor, in dollars per lb (kg)

$$D = MPI_M - MPI_L$$

Where:  $MPI_M$  = The Materials Cost Index for steel as published by the Engineering News-Record for the month the steel is shipped from the mill. The indices will be converted from dollars per 100 lb to dollars per lb (kg).

$MPI_L$  = The Materials Cost Index for steel as published by the Engineering News-Record for the month prior to the letting. The indices will be converted from dollars per 100 lb to dollars per lb (kg).

The unit weights (masses) of steel that will be used to calculate the steel cost adjustment for the various items are shown in the attached table.

No steel cost adjustment will be made for any products manufactured from steel having a mill shipping date prior to the letting date.

If the Contractor fails to provide the required documentation, the method of adjustment will be calculated as described above; however, the  $MPI_M$  will be based on the date the steel arrives at the job site. In this case, an adjustment will only be made when there is a decrease in steel costs.

Basis of Payment. Steel cost adjustments may be positive or negative but will only be made when there is a difference between the  $MPI_L$  and  $MPI_M$  in excess of five percent, as calculated by:

$$\text{Percent Difference} = \{(MPI_L - MPI_M) \div MPI_L\} \times 100$$

Steel cost adjustments will be calculated by the Engineer and will be paid or deducted when all other contract requirements for the items of work are satisfied. Adjustments will only be made for fluctuations in the cost of the steel as described herein. No adjustment will be made for changes in the cost of manufacturing, fabrication, shipping, storage, etc.

The adjustments shall not apply during contract time subject to liquidated damages for completion of the entire contract.

**Attachment**

Item	Unit Mass (Weight)
Metal Piling (excluding temporary sheet piling) Furnishing Metal Pile Shells 12 in. (305 mm), 0.179 in. (3.80 mm) wall thickness Furnishing Metal Pile Shells 12 in. (305 mm), 0.250 in. (6.35 mm) wall thickness Furnishing Metal Pile Shells 14 in. (356 mm), 0.250 in. (6.35 mm) wall thickness Other piling	23 lb/ft (34 kg/m) 32 lb/ft (48 kg/m) 37 lb/ft (55 kg/m) See plans
Structural Steel	See plans for weights (masses)
Reinforcing Steel	See plans for weights (masses)
Dowel Bars and Tie Bars	6 lb (3 kg) each
Mesh Reinforcement	63 lb/100 sq ft (310 kg/sq m)
Guardrail Steel Plate Beam Guardrail, Type A w/steel posts Steel Plate Beam Guardrail, Type B w/steel posts Steel Plate Beam Guardrail, Types A and B w/wood posts Steel Plate Beam Guardrail, Type 2 Steel Plate Beam Guardrail, Type 6 Traffic Barrier Terminal, Type 1 Special (Tangent) Traffic Barrier Terminal, Type 1 Special (Flared)	20 lb/ft (30 kg/m) 30 lb/ft (45 kg/m) 8 lb/ft (12 kg/m) 305 lb (140 kg) each 1260 lb (570 kg) each 730 lb (330 kg) each 410 lb (185 kg) each
Steel Traffic Signal and Light Poles, Towers and Mast Arms Traffic Signal Post Light Pole, Tenon Mount and Twin Mount, 30 - 40 ft (9 - 12 m) Light Pole, Tenon Mount and Twin Mount, 45 - 55 ft (13.5 - 16.5 m) Light Pole w/Mast Arm, 30 - 50 ft (9 - 15.2 m) Light Pole w/Mast Arm, 55 - 60 ft (16.5 - 18 m) Light Tower w/Luminaire Mount, 80 - 110 ft (24 - 33.5 m) Light Tower w/Luminaire Mount, 120 - 140 ft (36.5 - 42.5 m) Light Tower w/Luminaire Mount, 150 - 160 ft (45.5 - 48.5 m)	11 lb/ft (16 kg/m) 14 lb/ft (21 kg/m) 21 lb/ft (31 kg/m) 13 lb/ft (19 kg/m) 19 lb/ft (28 kg/m) 31 lb/ft (46 kg/m) 65 lb/ft (97 kg/m) 80 lb/ft (119 kg/m)
Metal Railings (excluding wire fence) Steel Railing, Type SM Steel Railing, Type S-1 Steel Railing, Type T-1 Steel Bridge Rail	64 lb/ft (95 kg/m) 39 lb/ft (58 kg/m) 53 lb/ft (79 kg/m) 52 lb/ft (77 kg/m)
Frames and Grates Frame Lids and Grates	250 lb (115 kg) 150 lb (70 kg)



Return With Bid

**ILLINOIS DEPARTMENT  
OF TRANSPORTATION**

**OPTION FOR  
STEEL COST ADJUSTMENT**

The bidder shall submit this completed form with his/her bid. Failure to submit the form or properly complete contract number, company name, and sign and date the form shall make this contract exempt of steel cost adjustments for all items of steel. Failure to indicate "Yes" for any item of work will make that item of steel exempt from steel cost adjustment. After award, this form, when submitted shall become part of the contract.

**Contract No.:** \_\_\_\_\_

**Company Name:** \_\_\_\_\_

**Contractor's Option:**

Is your company opting to include this special provision as part of the contract plans for the following items of work?

- |  |     |                          |
|--|-----|--------------------------|
| Metal Piling   | Yes | <input type="checkbox"/> |
| Structural Steel   | Yes | <input type="checkbox"/> |
| Reinforcing Steel  | Yes | <input type="checkbox"/> |
| Dowel Bars, Tie Bars and Mesh Reinforcement                | Yes | <input type="checkbox"/> |
| Guardrail  | Yes | <input type="checkbox"/> |
| Steel Traffic Signal and Light Poles, Towers and Mast Arms | Yes | <input type="checkbox"/> |
| Metal Railings (excluding wire fence)                      | Yes | <input type="checkbox"/> |
| Frames and Grates  | Yes | <input type="checkbox"/> |

**Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

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**PROJECT LABOR AGREEMENT - QUARTERLY EMPLOYMENT REPORT**

Public Act 97-0199 requires the Department to submit quarterly reports regarding the number of minorities and females employed under Project Labor Agreements. To assist in this reporting effort, the Contractor shall provide a quarterly workforce participation report for all minority and female employees working under the project labor agreement of this contract. The data shall be reported on Construction Form BC 820, Project Labor Agreement (PLA) Workforce Participation Quarterly Reporting Form available on the Department's website <http://www.dot.il.gov/const/conforms.html>.

The report shall be submitted no later than the 15<sup>th</sup> of the month following the end of each quarter (i.e. April 15 for the January – March reporting period). The form shall be emailed to [DOT.PLA.Reporting@illinois.gov](mailto:DOT.PLA.Reporting@illinois.gov) or faxed to (217) 524-4922.

Any costs associated with complying with this provision shall be considered as included in the contract unit prices bid for the various items of work involved and no additional compensation will be allowed.

Illinois Department of Transportation  
**PROJECT LABOR AGREEMENT**

This Project Labor Agreement ("PLA" or "Agreement") is entered into this \_\_\_\_\_ day of \_\_\_\_\_, 2013, by and between the Illinois Department of Transportation ("IDOT" or "Department") in its proprietary capacity, and each relevant Illinois AFL-CIO Building Trades signatory hereto as determined by the Illinois AFL-CIO Statewide Project Labor Agreement Committee on behalf of each of its affiliated members (individually and collectively, the "Unions"). This PLA shall apply to Construction Work (as defined herein) to be performed by IDOT's Prime Contractor and each of its subcontractors of whatever tier ("Subcontractor" or "Subcontractors") on Contract No. **60W26** (hereinafter, the "Project").

**ARTICLE 1 - INTENT AND PURPOSES**

- 1.1 This PLA is entered into in accordance with the Project Labor Agreement Act ("Act", 30 ILCS 571). It is mutually understood and agreed that the terms and conditions of this PLA are intended to promote the public interest in obtaining timely and economical completion of the Project by encouraging productive and efficient construction operations; by establishing a spirit of harmony and cooperation among the parties; and by providing for peaceful and prompt settlement of any and all labor grievances or jurisdictional disputes of any kind without strikes, lockouts, slowdowns, delays, or other disruptions to the prosecution of the work. The parties acknowledge the obligations of the Contractors and Subcontractors to comply with the provisions of the Act. The parties will work with the Contractors and Subcontractors within the parameters of other statutory and regulatory requirements to implement the Act's goals and objectives.
- 1.2 As a condition of the award of the contract for performance of work on the Project, IDOT's Prime Contractor and each of its Subcontractors shall execute a "Contractor Letter of Assent", in the form attached hereto as Exhibit A, prior to commencing Construction Work on the Project. The Contractor shall submit a Subcontractor's Contractor Letter of Assent to the Department prior to the Subcontractor's performance of Construction Work on the Project. Upon request copies of the applicable collective bargaining agreements will be provided by the appropriate signatory labor organization consistent with this Agreement and at the pre-job conference referenced in Article III, Section 3.1.
- 1.3 Each Union affiliate and separate local representing workers engaged in Construction Work on the Project in accordance with this PLA are bound to this agreement by the Illinois AFL-CIO Statewide Project Labor Agreement Committee which is the central committee established with full authority to negotiate and sign PLAs with the State on behalf of all respective crafts. Upon their signing the Contractor Letter of Assent, the Prime Contractor, each Subcontractor, and the individual Unions shall thereafter be deemed a party to this PLA. No party signatory to this PLA shall, contract or subcontract, nor permit any other person, firm, company, or entity to contract or subcontract for the performance of Construction Work for the Project to any person, firm, company, or entity that does not agree in writing to become bound for the term of this Project by the terms of this PLA prior to commencing such work and to the applicable area-wide collective bargaining agreement(s) with the Union(s) signatory hereto.

- 1.4 It is understood that the Prime Contractor(s) and each Subcontractor will be considered and accepted by the Unions as separate employers for the purposes of collective bargaining, and it is further agreed that the employees working under this PLA shall constitute a bargaining unit separate and distinct from all others. The parties hereto also agree that this PLA shall be applicable solely with respect to this Project, and shall have no bearing on the interpretation of any other collective bargaining agreement or as to the recognition of any bargaining unit other than for the specific purposes of this Project.
- 1.5 In the event of a variance or conflict, whether explicit or implicit, between the terms and conditions of this PLA and the provisions of any other applicable national, area, or local collective bargaining agreement, the terms and conditions of this PLA shall supersede and control. For any work performed under the NTL Articles of Agreement, the National Stack/Chimney Agreement, the National Cooling Tower Agreement, the National Agreement of the International Union of Elevator Constructors, and for any instrument calibration work and loop checking performed under the UA/IBEW Joint National Agreement for Instrument and Control Systems Technicians, the preceding sentence shall apply only with respect to Articles I, II, V, VI, and VII.
- 1.6 Subject to the provisions of paragraph 1.5 of this Article, it is the parties' intent to respect the provisions of any other collective bargaining agreements that may now or hereafter pertain, whether between the Prime Contractor and one or more of the Unions or between a Subcontractor and one or more of the Unions. Accordingly, except and to the extent of any contrary provision set forth in this PLA, the Prime Contractor and each of its Subcontractors agrees to be bound and abide by the terms of the following in order of precedence: (a) the applicable collective bargaining agreement between the Prime Contractor and one or more of the Unions made signatory hereto; (b) the applicable collective bargaining agreement between a Subcontractor and one or more of the Unions made signatory hereto; or (c) the current applicable area collective bargaining agreement for the relevant Union that is the agreement certified by the Illinois Department of Labor for purposes of establishing the Prevailing Wage applicable to the Project. The Union will provide copies of the applicable collective bargaining agreements pursuant to part (c) of the preceding sentence to the Prime Contractor. Assignments by the Contractors or Subcontractors amongst the trades shall be consistent with area practices; in the event of unresolved disagreements as to the propriety of such assignments, the provisions of Article VI shall apply.
- 1.7 Subject to the limitations of paragraphs 1.4 to 1.6 of this Article, the terms of each applicable collective bargaining agreement as determined in accordance with paragraph 1.6 are incorporated herein by reference, and the terms of this PLA shall be deemed incorporated into such other applicable collective bargaining agreements only for purposes of their application to the Project.
- 1.8 To the extent necessary to comply with the requirements of any fringe benefit fund to which the Prime Contractor or Subcontractor is required to contribute under the terms of an applicable collective bargaining agreement pursuant to the preceding paragraph, the Prime Contractor or Subcontractor shall execute all "Participation Agreements" as may be reasonably required by the Union to accomplish such purpose; provided, however,

that such Participation Agreements shall, when applicable to the Prime Contractor or Subcontractor solely as a result of this PLA, be amended as reasonably necessary to reflect such fact. Upon written notice in the form of a lien of a Contractor's or Subcontractor's delinquency from any applicable fringe benefit fund, IDOT will withhold from the Contractor's periodic pay request an amount sufficient to extinguish any delinquency obligation of the Contractor or Subcontractor arising out of the Project.

- 1.9 In the event that the applicable collective bargaining agreement between a Prime Contractor and the Union or between the Subcontractor and the Union expires prior to the completion of this Project, the expired applicable contract's terms will be maintained until a new applicable collective bargaining agreement is ratified. The wages and fringe benefits included in any new applicable collective bargaining agreement will apply on and after the effective date of the newly negotiated collective bargaining agreement, except to the extent wage and fringe benefit retroactivity is specifically agreed upon by the relevant bargaining parties.

## **ARTICLE II – APPLICABILITY, RECOGNITION, AND COMMITMENTS**

- 2.1 The term Construction Work as used herein shall include all "construction, demolition, rehabilitation, renovation, or repair" work performed by a "laborer or mechanic" at the "site of the work" for the purpose of "building" the specific structures and improvements that constitute the Project. Terms appearing within quotation marks in the preceding sentence shall have the meaning ascribed to them pursuant to 29 CFR Part 5 and Illinois labor laws.
- 2.2 By executing the Letters of Assent, Prime Contractor and each of its Subcontractors recognizes the Unions signatory to this PLA as the sole and exclusive bargaining representatives for their craft employees employed on the jobsite for this Project. Unions who are signatory to this PLA will have recognition on the Project for their craft.
- 2.3 The Prime Contractor and each of its Subcontractors retains and shall be permitted to exercise full and exclusive authority and responsibility for the management of its operations, except as expressly limited by the terms of this PLA or by the terms and conditions of the applicable collective bargaining agreement.
- 2.4 Except to the extent contrary to an express provision of the relevant collective bargaining agreement, equipment or materials used in the Project may be pre-assembled or pre-fabricated, and there shall be no refusal by the Union to handle, transport, install, or connect such equipment or materials. Equipment or materials delivered to the job-site will be unloaded and handled promptly without regard to potential jurisdictional disputes; any such disputes shall be handled in accordance with the provisions of this PLA.
- 2.5 The parties are mutually committed to promoting a safe working environment for all personnel at the job-site. It shall be the responsibility of each employer to which this PLA applies to provide and maintain safe working conditions for its employees, and to comply with all applicable federal, state, and local health and safety laws and regulations.

- 2.6 The use or furnishing of alcohol or drugs and the conduct of any other illegal activity at the job-site is strictly prohibited. The parties shall take every practical measure consistent with the terms of applicable collective bargaining agreements to ensure that the job-site is free of alcohol and drugs.
- 2.7 All parties to this PLA agree that they will not discriminate against any employee based on race, creed, religion, color, national origin, union activity, age, gender or sexual orientation and shall comply with all applicable federal, state, and local laws.
- 2.8 In accordance with the Act and to promote diversity in employment, IDOT will establish, in cooperation with the other parties, the apprenticeship hours which are to be performed by minorities and females on the Project. IDOT shall consider the total hours to be performed by these underrepresented groups, as a percentage of the workforce, and create aspirational goals for each Project, based on the level of underutilization for the service area of the Project (together "Project Employment Objectives"). IDOT shall provide a quarterly report regarding the racial and gender composition of the workforce on the Project.

Persons currently lacking qualifications to enter apprenticeship programs will have the opportunity to obtain skills through basic training programs as have been established by the Department. The parties will endeavor to support such training programs to allow participants to obtain the requisite qualifications for the Project Employment Objectives.

The parties agree that all Contractors and Subcontractors working on the Project shall be encouraged to utilize the maximum number of apprentices as permitted under the terms of the applicable collective bargaining agreements to realize the Project Employment Objectives.

The Unions shall assist the Contractor and each Subcontractor in efforts to satisfy Project Employment Objectives. A Contractor or Subcontractor may request from a Union specific categories of workers necessary to satisfy Project Employment Objectives. The application of this section shall be consistent with all local Union collective bargaining agreements, and the hiring hall rules and regulations established for the hiring of personnel, as well as the apprenticeship standards set forth by each individual Union.

- 2.9 The parties hereto agree that engineering/architectural/surveying consultants' materials testing employees are subject to the terms of this PLA for Construction Work performed for a Contractor or Subcontractor on this Project. These workers shall be fully expected to objectively and responsibly perform their duties and obligations owed to the Department without regard to the potential union affiliation of such employees or of other employees on the Project.
- 2.10 This Agreement shall not apply to IDOT employees or employees of any other governmental entity.

### **ARTICLE III - ADMINISTRATION OF AGREEMENT**

- 3.1 In order to assure that all parties have a clear understanding of the PLA, and to promote harmony, at the request of the Unions a post-award pre-job conference will be held among the Prime Contractor, all Subcontractors and Union representatives prior to the start of any Construction Work on the Project. No later than the conclusion of such pre-job conference, the parties shall, among other matters, provide to one another contact information for their respective representatives (including name, address, phone number, facsimile number, e-mail). Nothing herein shall be construed to limit the right of the Department to discuss or explain the purpose and intent of this PLA with prospective bidders or other interested parties prior to or following its award of the job.
- 3.2 Representatives of the Prime Contractor and the Unions shall meet as often as reasonably necessary following award until completion of the Project to assure the effective implementation of this PLA.
- 3.3 Any notice contemplated under Article VI and VII of this Agreement to a signatory labor organization shall be made in writing to the Local Union with copies to the local union's International Representative.

#### **ARTICLE IV - HOURS OF WORK AND GENERAL CONDITIONS**

- 4.1 The standard work day and work week for Construction Work on the Project shall be consistent with the respective collective bargaining agreements. In the event Project site or other job conditions dictate a change in the established starting time and/or a staggered lunch period for portions of the Project or for specific crafts, the Prime Contractor, relevant Subcontractors and business managers of the specific crafts involved shall confer and mutually agree to such changes as appropriate. If proposed work schedule changes cannot be mutually agreed upon between the parties, the hours fixed at the time of the pre-job meeting shall prevail.
- 4.2 Shift work may be established and directed by the Prime Contractor or relevant Subcontractor as reasonably necessary or appropriate to fulfill the terms of its contract with the Department. If used, shift hours, rates and conditions shall be as provided in the applicable collective bargaining agreement.
- 4.3 The parties agree that chronic and/or unexcused absenteeism is undesirable and must be controlled in accordance with procedures established by the applicable collective bargaining agreement. Any employee disciplined for absenteeism in accordance with such procedures shall be suspended from all work on the Project for not less than the maximum period permitted under the applicable collective bargaining agreement.
- 4.4 Except as may be otherwise expressly provided by the applicable collective bargaining agreement, employment begins and ends at the Project site; employees shall be at their place of work at the starting time; and employees shall remain at their place of work until quitting time.
- 4.5 Except as may be otherwise expressly provided by the applicable collective bargaining agreement, there shall be no limit on production by workmen, no restrictions on the full

use of tools or equipment, and no restrictions on efficient use of manpower or techniques of construction other than as may be required by safety regulations.

- 4.6 The parties recognize that specialized or unusual equipment may be installed on the Project. In such cases, the Union recognizes the right of the Prime Contractor or Subcontractor to involve the equipment supplier or vendor's personnel in supervising the setting up of the equipment, making modifications and final alignment, and performing similar activities that may be reasonably necessary prior to and during the start-up procedure in order to protect factory warranties. The Prime Contractor or Subcontractor shall notify the Union representatives in advance of any work at the job-site by such vendor personnel in order to promote a harmonious relationship between the equipment vendor's personnel and other Project employees.
- 4.7 For the purpose of promoting full and effective implementation of this PLA, authorized Union representatives shall have access to the Project job-site during scheduled work hours. Such access shall be conditioned upon adherence to all reasonable visitor and security rules of general applicability that may be established for the Project site at the pre-job conference or from time to time thereafter.

**ARTICLE V – GRIEVANCE PROCEDURES FOR DISPUTES ARISING UNDER A PARTICULAR COLLECTIVE BARGAINING AGREEMENT**

- 5.1 In the event a dispute arises under a particular collective bargaining agreement specifically not including jurisdictional disputes referenced in Article VI below, said dispute shall be resolved by the Grievance/Arbitration procedure of the applicable collective bargaining agreement. The resulting determination from this process shall be final and binding on all parties bound to its process.
- 5.2 Employers covered under this Agreement shall have the right to discharge or discipline any employee who violates the provisions of this Agreement. Such discharge or discipline by a contractor or subcontractor shall be subject to Grievance/Arbitration procedure of the applicable collective bargaining agreement only as to the fact of such violation of this agreement. If such fact is established, the penalty imposed shall not be disturbed. Work at the Project site shall continue without disruption or hindrance of any kind as a result of a Grievance/Arbitration procedure under this Article.
- 5.3 In the event there is a deadlock in the foregoing procedure, the parties agree that the matter shall be submitted to arbitration for the selection and decision of an Arbitrator governed under paragraph 6.8.

**ARTICLE VI –DISPUTES: GENERAL PRINCIPLES**

- 6.1 This Agreement is entered into to prevent strikes, lost time, lockouts and to facilitate the peaceful adjustment of jurisdictional disputes in the building and construction industry and to prevent waste and unnecessary avoidable delays and expense, and for the further purpose of at all times securing for the employer sufficient skilled workers.



- 6.2 A panel of Permanent Arbitrators are attached as addendum (A) to this agreement. By mutual agreement between IDOT and the Unions, the parties can open this section of the agreement as needed to make changes to the list of permanent arbitrators.
- 6.3 The PLA Jurisdictional Dispute Resolution Process ("Process") sets forth the procedures below to resolve jurisdictional disputes between and among Contractors, Subcontractors, and Unions engaged in the building and construction industry. Further, the Process will be followed for any grievance or dispute arising out of the interpretation or application of this PLA by the parties except for the prohibition on attorneys contained in 6.11. All decisions made through the Process are final and binding upon all parties.

### **DISPUTE PROCESS**

- 6.4 Administrative functions under the Process shall be performed through the offices of the President and/or Secretary-Treasurer of the Illinois State Federation of Labor, or their designated representative, called the Administrator. In no event shall any officer, employee, agent, attorney, or other representative of the Illinois Federation of Labor, AFL-CIO be subject to any subpoena to appear or testify at any jurisdictional dispute hearing.
- 6.5 There shall be no abandonment of work during any case participating in this Process or in violation of the arbitration decision. All parties to this Process release the Illinois State Federation of Labor ("Federation") from any liability arising from its action or inaction and covenant not to sue the Federation, nor its officers, employees, agents or attorneys.
- 6.6 In the event of a dispute relating to trade or work jurisdiction, all parties, including the employers, Contractors or Subcontractors, agree that a final and binding resolution of the dispute shall be resolved as follows:
- (a) Representatives of the affected trades and the Contractor or Subcontractor shall meet on the job site within two (2) business days after receiving written notice in an effort to resolve the dispute. (In the event there is a dispute between local unions affiliated with the same International Union, the decision of the General President, or his/her designee, as the internal jurisdictional authority of that International Union, shall constitute a final and binding decision and determination as to the jurisdiction of work.)
  - (b) If no settlement is achieved subsequent to the preceding Paragraph, the matter shall be referred to the local area Building & Construction Trades Council, which shall meet with the affected trades within two (2) business days subsequent to receiving written notice. In the event the parties do not wish to avail themselves of the local Building & Construction Trades Council, the parties may elect to invoke the services of their respective International Representatives with no extension of the time limitations. An agreement reached at this Step shall be final and binding upon all parties.
  - (c) If no settlement agreement is reached during the proceedings contemplated by Paragraphs "a" or "b" above, the matter shall be immediately referred to the Illinois

Jurisdictional Dispute Process for final and binding resolution of said dispute. Said referral submission shall be in writing and served upon the Illinois State Federation of Labor, or the Administrator, pursuant to paragraph 6.4 of this agreement. The Administrator shall, within three (3) days, provide for the selection of an available Arbitrator to hear said dispute within this time period. Upon good cause shown and determined by the Administrator, an additional three (3) day extension for said hearing shall be granted at the sole discretion of the Administrator. Only upon mutual agreement of all parties may the Administrator extend the hearing for a period in excess of the time frames contemplated under this Paragraph. Business days are defined as Monday through Friday, excluding contract holidays.

- 6.7 The primary concern of the Process shall be the adjustment of jurisdictional disputes arising out of the Project. A sufficient number of Arbitrators shall be selected from list of approved Arbitrators as referenced Sec. 6.2 and shall be assigned per Sec. 6.8. Decisions shall be only for the Project and shall become effective immediately upon issuance and complied with by all parties. The authority of the Arbitrator shall be restricted and limited specifically to the terms and provisions of Article VI and generally to this Agreement as a whole.
- 6.8 The Arbitrator chosen shall be randomly selected based on the list of Arbitrators in Sec. 6.2 and geographical location of the jurisdictional dispute and upon his/her availability, and ability to conduct a Hearing within two (2) business days of said notice. The Arbitrator may issue a "bench" decision immediately following the Hearing or he/she may elect to only issue a written decision, said decision must be issued within two (2) business days subsequent to the completion of the Hearing. Copies of all notices, pleadings, supporting memoranda, decisions, etc. shall be provided to all disputing parties and the Illinois State Federation of Labor.

Any written decision shall be in accordance with this Process and shall be final and binding upon all parties to the dispute and may be a "short form" decision. Fees and costs of the arbitrator shall be divided evenly between the contesting parties except that any party wishing a full opinion and decision beyond the short form decision shall bear the reasonable fees and costs of such full opinion. The decision of the Arbitrator shall be final and binding upon the parties hereto, their members, and affiliates.

In cases of jurisdictional disputes or other disputes between a signatory labor organization and another labor organization, both of which is an affiliate or member of the same International Union, the matter or dispute shall be settled in the manner set forth by their International Constitution and/or as determined by the International Union's General President whose decision shall be final and binding upon all parties. In no event shall there be an abandonment of work.

- 6.9 In rendering a decision, the Arbitrator shall determine:
- (a) First, whether a previous agreement of record or applicable agreement, including a disclaimer agreement, between National or International Unions to the dispute or agreements between local unions involved in the dispute, governs;

- (b) Only if the Arbitrator finds that the dispute is not covered by an appropriate or applicable agreement of record or agreement between the crafts to the dispute, he shall then consider the established trade practice in the industry and prevailing practice in the locality. Where there is a previous decision of record governing the case, the Arbitrator shall give equal weight to such decision of record, unless the prevailing practice in the locality in the past ten years favors one craft. In that case, the Arbitrator shall base his decision on the prevailing practice in the locality. Except, that if the Arbitrator finds that a craft has improperly obtained the prevailing practice in the locality through raiding, the undercutting of wages or by the use of vertical agreements, the Arbitrator shall rely on the decision of record and established trade practice in the industry rather than the prevailing practice in the locality; and,
- (c) Only if none of the above criteria is found to exist, the Arbitrator shall then consider that because efficiency, cost or continuity and good management are essential to the well being of the industry, the interests of the consumer or the past practices of the employer shall not be ignored.

- 6.10 The Arbitrator shall set forth the basis for his/her decision and shall explain his/her findings regarding the applicability of the above criteria. If lower ranked criteria are relied upon, the Arbitrator shall explain why the higher-ranked criteria were not deemed applicable. The Arbitrator's decision shall only apply to the Project. Agreements of Record, for other PLA projects, are applicable only to those parties signatory to such agreements. Decisions of Record are those that were either attested to by the former Impartial Jurisdictional Disputes Board or adopted by the National Arbitration Panel.
- 6.11 All interested parties, as determined by the Arbitrator, shall be entitled to make presentations to the Arbitrator. Any interested labor organization affiliated to the PLA Committee and party present at the Hearing, whether making a presentation or not, by such presence shall be deemed to accept the jurisdiction of the Arbitrator and to agree to be bound by its decision. In addition to the representative of the local labor organization, a representative of the labor organization's International Union may appear on behalf of the parties. Each party is responsible for arranging for its witnesses. In the event an Arbitrator's subpoena is required, the party requiring said subpoena shall prepare the subpoena for the Arbitrator to execute. Service of the subpoena upon any witness shall be the responsibility of the issuing party.

Attorneys shall not be permitted to attend or participate in any portion of a Hearing.

The parties are encouraged to determine, prior to Hearing, documentary evidence which may be presented to the Arbitrator on a joint basis.

- 6.12 The Order of Presentation in all Hearings before an Arbitrator shall be
  - I. Identification and Stipulation of the Parties
  - II. Unions(s) claiming the disputed work presents its case
  - III. Union(s) assigned the disputed work presents its case
  - IV. Employer assigning the disputed work presents its case

- V. Evidence from other interested parties (i.e., general contractor, project manager, owner)
  - VI. Rebuttal by union(s) claiming the disputed work
  - VII. Additional submissions permitted and requested by Arbitrator
  - VIII. Closing arguments by the parties
- 6.13 All parties bound to the provisions of this Process hereby release the Illinois State Federation of Labor and IDOT, their respective officers, agents, employees or designated representatives, specifically including any Arbitrator participating in said Process, from any and all liability or claim, of whatsoever nature, and specifically incorporating the protections provided in the Illinois Arbitration Act, as amended from time to time.
- 6.14 The Process, as an arbitration panel, nor its Administrator, shall have any authority to undertake any action to enforce its decision(s). Rather, it shall be the responsibility of the prevailing party to seek appropriate enforcement of a decision, including findings, orders or awards of the Arbitrator or Administrator determining non-compliance with a prior award or decision.
- 6.15 If at any time there is a question as to the jurisdiction of the Illinois Jurisdictional Dispute Resolution Process, the primary responsibility for any determination of the arbitrability of a dispute and the jurisdiction of the Arbitrator shall be borne by the party requesting the Arbitrator to hear the underlying jurisdictional dispute. The affected party or parties may proceed before the Arbitrator even in the absence or one or more stipulated parties with the issue of jurisdiction as an additional item to be decided by the Arbitrator. The Administrator may participate in proceedings seeking a declaration or determination that the underlying dispute is subject to the jurisdiction and process of the Illinois Jurisdictional Dispute Resolution Process. In any such proceedings, the non-prevailing party and/or the party challenging the jurisdiction of the Illinois Jurisdictional Dispute Resolution Process shall bear all the costs, expenses and attorneys' fees incurred by the Illinois Jurisdictional Dispute Resolution Process and/or its Administrator in establishing its jurisdiction.

#### **ARTICLE VII - WORK STOPPAGES AND LOCKOUTS**

- 7.1 During the term of this PLA, no Union or any of its members, officers, stewards, employees, agents or representatives shall instigate, support, sanction, maintain, or participate in any strike, picketing, walkout, work stoppage, slow down or other activity that interferes with the routine and timely prosecution of work at the Project site or at any other contractor's or supplier's facility that is necessary to performance of work at the Project site. Hand billing at the Project site during the designated lunch period and before commencement or following conclusion of the established standard workday shall not, in itself, be deemed an activity that interferes with the routine and timely prosecution of work on the Project.
- 7.2 Should any activity prohibited by paragraph 7.1 of this Article occur, the Union shall undertake all steps reasonably necessary to promptly end such prohibited activities.

- 7.2.A No Union complying with its obligations under this Article shall be liable for acts of employees for which it has no responsibility or for the unauthorized acts of employees it represents. Any employee who participates or encourages any activity prohibited by paragraph 7.1 shall be immediately suspended from all work on the Project for a period equal to the greater of (a) 60 days; or (b) the maximum disciplinary period allowed under the applicable collective bargaining agreement for engaging in comparable unauthorized or prohibited activity.
- 7.2.B Neither the PLA Committee nor its affiliates shall be liable for acts of employees for which it has no responsibility. The principal officer or officers of the PLA Committee will immediately instruct, order and use the best efforts of his office to cause the affiliated union or unions to cease any violations of this Article. The PLA Committee in its compliance with this obligation shall not be liable for acts of its affiliates. The principal officer or officers of any involved affiliate will immediately instruct, order or use the best effort of his office to cause the employees the union represents to cease any violations of this Article. A union complying with this obligation shall not be liable for unauthorized acts of employees it represents. The failure of the Contractor to exercise its rights in any instance shall not be deemed a waiver of its rights in any other instance.

During the term of this PLA, the Prime Contractor and its Subcontractors shall not engage in any lockout at the Project site of employees covered by this Agreement.

- 7.3 Upon notification of violations of this Article, the principal officer or officers of the local area Building and Construction Trades Council, and the Illinois AFL-CIO Statewide Project Labor Agreement Committee as appropriate, will immediately instruct, order and use their best efforts to cause the affiliated union or unions to cease any violations of this Article. A Trades Council and the Committee otherwise in compliance with the obligations under this paragraph shall not be liable for unauthorized acts of its affiliates.
- 7.4 In the event that activities in violation of this Article are not immediately halted through the efforts of the parties, any aggrieved party may invoke the special arbitration provisions set forth in paragraph 7.5 of this Article.
- 7.5 Upon written notice to the other involved parties by the most expeditious means available, any aggrieved party may institute the following special arbitration procedure when a breach of this Article is alleged:
- 7.5.A The party invoking this procedure shall notify the individual designated as the Permanent Arbitrator pursuant to paragraph 6.8 of the nature of the alleged violation; such notice shall be by the most expeditious means possible. The initiating party may also furnish such additional factual information as may be reasonably necessary for the Permanent Arbitrator to understand the relevant circumstances. Copies of any written materials provided to the arbitrator shall also be contemporaneously provided by the most expeditious means possible to the party alleged to be in violation and to all other involved parties.

- 7.5.B Upon receipt of said notice the Permanent Arbitrator shall set and hold a hearing within twenty-four (24) hours if it is contended the violation is ongoing, but not before twenty-four (24) hours after the written notice to all parties involved as required above.
- 7.5.C The Permanent Arbitrator shall notify the parties by facsimile or any other effective written means, of the place and time chosen by the Permanent Arbitrator for this hearing. Said hearing shall be completed in one session. A failure of any party or parties to attend said hearing shall not delay the hearing of evidence or issuance of an Award by the Permanent Arbitrator.
- 7.5.D The sole issue at the hearing shall be whether a violation of this Article has, in fact, occurred. An Award shall be issued in writing within three (3) hours after the close of the hearing, and may be issued without a written opinion. If any party desires a written opinion, one shall be issued within fifteen (15) days, but its issuance shall not delay compliance with, or enforcement of, the Award. The Permanent Arbitrator may order cessation of the violation of this Article, and such Award shall be served on all parties by hand or registered mail upon issuance.
- 7.5.E Such Award may be enforced by any court of competent jurisdiction upon the filing of the Award and such other relevant documents as may be required. Facsimile or other hardcopy written notice of the filing of such enforcement proceedings shall be given to the other relevant parties. In a proceeding to obtain a temporary order enforcing the Permanent Arbitrator's Award as issued under this Article, all parties waive the right to a hearing and agree that such proceedings may be ex parte. Such agreement does not waive any party's right to participate in a hearing for a final order of enforcement. The Court's order or orders enforcing the Permanent Arbitrator's Award shall be served on all parties by hand or by delivery to their last known address or by registered mail.
- 7.6 Individuals found to have violated the provisions of this Article are subject to immediate termination. In addition, IDOT reserves the right to terminate this PLA as to any party found to have violated the provisions of this Article.
- 7.7 Any rights created by statute or law governing arbitration proceedings inconsistent with the above procedure or which interfere with compliance therewith are hereby waived by parties to whom they accrue.
- 7.8 The fees and expenses of the Permanent Arbitrator shall be borne by the party or parties found in violation, or in the event no violation is found, such fees and expenses shall be borne by the moving party.

### **ARTICLE VIII – TERMS OF AGREEMENT**

- 8.1 If any Article or provision of this Agreement shall be declared invalid, inoperative or unenforceable by operation of law or by any of the above mentioned tribunals of competent jurisdiction, the remainder of this Agreement or the application of such Article

or provision to persons or circumstances other than those as to which it has been held invalid, inoperative or unenforceable shall not be affected thereby.

- 8.2 This Agreement shall be in full force as of and from the date of the Notice of Award until the Project contract is closed.
- 8.3 This PLA may not be changed or modified except by the subsequent written agreement of the parties. All parties represent that they have the full legal authority to enter into this PLA. This PLA may be executed by the parties in one or more counterparts.
- 8.4 Any liability arising out of this PLA shall be several and not joint. IDOT shall not be liable to any person or other party for any violation of this PLA by any other party, and no Contractor or Union shall be liable for any violation of this PLA by any other Contractor or Union.
- 8.5 The failure or refusal of a party to exercise its rights hereunder in one or more instances shall not be deemed a waiver of any such rights in respect of a separate instance of the same or similar nature.

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Addendum A

IDOT Slate of Permanent Arbitrators

1. Bruce Feldacker
2. Thomas F. Gibbons
3. Edward J. Harrick
4. Brent L. Motchan
5. Robert Perkovich
6. Byron Yaffee
7. Glenn A. Zipp



**Execution Page**

***Illinois Department of Transportation***

\_\_\_\_\_  
Omer Osman, Director of Highways

\_\_\_\_\_  
Matthew Hughes, Director Finance & Administration

\_\_\_\_\_  
Michael A. Forti, Chief Counsel

\_\_\_\_\_  
Ann L. Schneider, Secretary

\_\_\_\_\_  
(Date)

***Illinois AFL-CIO Statewide Project Labor Agreement Committee, representing the Unions listed below:***

\_\_\_\_\_

\_\_\_\_\_  
(Date)

List Unions:

**\*\*RETURN WITH BID\*\***

Exhibit A - Contractor Letter of Assent

\_\_\_\_\_  
(Date)

To All Parties:

In accordance with the terms and conditions of the contract for Construction Work on [Contract No. **60W26** ], this Letter of Assent hereby confirms that the undersigned Prime Contractor or Subcontractor agrees to be bound by the terms and conditions of the Project Labor Agreement established and entered into by the Illinois Department of Transportation in connection with said Project.

It is the understanding and intent of the undersigned party that this Project Labor Agreement shall pertain only to the identified Project. In the event it is necessary for the undersigned party to become signatory to a collective bargaining agreement to which it is not otherwise a party in order that it may lawfully make certain required contributions to applicable fringe benefit funds, the undersigned party hereby expressly conditions its acceptance of and limits its participation in such collective bargaining agreement to its work on the Project.

\_\_\_\_\_  
(Authorized Company Officer)

\_\_\_\_\_  
(Company)

**\*\*RETURN WITH BID\*\***

## REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONSTRUCTION CONTRACTS

- I. General
- II. Nondiscrimination
- III. Nonsegregated Facilities
- IV. Davis-Bacon and Related Act Provisions
- V. Contract Work Hours and Safety Standards Act Provisions
- VI. Subletting or Assigning the Contract
- VII. Safety: Accident Prevention
- VIII. False Statements Concerning Highway Projects
- IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
- X. Compliance with Governmentwide Suspension and Debarment Requirements
- XI. Certification Regarding Use of Contract Funds for Lobbying

### ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

#### I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

#### II. NONDISCRIMINATION

The provisions of this section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding \$10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

**1. Equal Employment Opportunity:** Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.

b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

**2. EEO Officer:** The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

**3. Dissemination of Policy:** All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

**4. Recruitment:** When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

**5. Personnel Actions:** Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If

the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

## **6. Training and Promotion:**

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

**7. Unions:** If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

**8. Reasonable Accommodation for Applicants / Employees with Disabilities:** The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

**9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:** The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.

b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

#### **10. Assurance Required by 49 CFR 26.13(b):**

a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.

b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.

**11. Records and Reports:** The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;

b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on [Form FHWA-1391](#). The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

#### **III. NONSEGREGATED FACILITIES**

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color,

religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

#### **IV. Davis-Bacon and Related Act Provisions**

This section is applicable to all Federal-aid construction projects exceeding \$2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 "Contract provisions and related matters" with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

##### **1. Minimum wages**

a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b.(1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is utilized in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

## 2. Withholding

The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such

action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

## 3. Payrolls and basic records

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b. (1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee ( e.g. , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency..

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

#### 4. Apprentices and trainees

##### a. Apprentices (programs of the USDOL).

Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

##### b. Trainees (programs of the USDOL).

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

##### d. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

**5. Compliance with Copeland Act requirements.** The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

**6. Subcontracts.** The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

**7. Contract termination: debarment.** A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for

debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

**8. Compliance with Davis-Bacon and Related Act requirements.** All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

**9. Disputes concerning labor standards.** Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

#### **10. Certification of eligibility.**

a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

#### **V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT**

The following clauses apply to any Federal-aid construction contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

**1. Overtime requirements.** No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

**2. Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.

**3. Withholding for unpaid wages and liquidated damages.** The FHWA or the contacting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such

contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.

**4. Subcontracts.** The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

#### **VI. SUBLETTING OR ASSIGNING THE CONTRACT**

This provision is applicable to all Federal-aid construction contracts on the National Highway System.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term "perform work with its own organization" refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:

(1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;

(2) the prime contractor remains responsible for the quality of the work of the leased employees;

(3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and

(4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.



4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

## **VII. SAFETY: ACCIDENT PREVENTION**

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.3704).

## **VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS**

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

## **IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT**

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.

2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

## **X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION**

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost \$25,000 or more – as defined in 2 CFR Parts 180 and 1200.

### **1. Instructions for Certification – First Tier Participants:**

a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded,"

as used in this clause, are defined in 2 CFR Parts 180 and 1200. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

\* \* \* \* \*

## **2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:**

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;

(2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with

commission of any of the offenses enumerated in paragraph (a)(2) of this certification; and

(4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

### **2. Instructions for Certification - Lower Tier Participants:**

(Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior FHWA approval or estimated to cost \$25,000 or more - 2 CFR Parts 180 and 1200)

a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the

certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

\* \* \* \* \*

**Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:**

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

\* \* \* \* \*

**XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING**

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000 (49 CFR 20).

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

**MINIMUM WAGES FOR FEDERAL AND FEDERALLY  
ASSISTED CONSTRUCTION CONTRACTS**

This project is funded, in part, with Federal-aid funds and, as such, is subject to the provisions of the Davis-Bacon Act of March 3, 1931, as amended (46 Sta. 1494, as amended, 40 U.S.C. 276a) and of other Federal statutes referred to in a 29 CFR Part 1, Appendix A, as well as such additional statutes as may from time to time be enacted containing provisions for the payment of wages determined to be prevailing by the Secretary of Labor in accordance with the Davis-Bacon Act and pursuant to the provisions of 29 CFR Part 1. The prevailing rates and fringe benefits shown in the General Wage Determination Decisions issued by the U.S. Department of Labor shall, in accordance with the provisions of the foregoing statutes, constitute the minimum wages payable on Federal and federally assisted construction projects to laborers and mechanics of the specified classes engaged on contract work of the character and in the localities described therein.

General Wage Determination Decisions, modifications and supersedes decisions thereto are to be used in accordance with the provisions of 29 CFR Parts 1 and 5. Accordingly, the applicable decision, together with any modifications issued, must be made a part of every contract for performance of the described work within the geographic area indicated as required by an applicable DBRA Federal prevailing wage law and 29 CFR Part 5. The wage rates and fringe benefits contained in the General Wage Determination Decision shall be the minimum paid by contractors and subcontractors to laborers and mechanics.

**NOTICE**

The most current **General Wage Determination Decisions** (wage rates) are available on the IDOT web site. They are located on the Letting and Bidding page at <http://www.dot.state.il.us/desenv/delett.html>.

In addition, ten (10) days prior to the letting, the applicable Federal wage rates will be e-mailed to subscribers. It is recommended that all contractors subscribe to the Federal Wage Rates List or the Contractor's Packet through IDOT's subscription service.

PLEASE NOTE: if you have already subscribed to the Contractor's Packet you will automatically receive the Federal Wage Rates.

The instructions for subscribing are at <http://www.dot.state.il.us/desenv/subsc.html>.

If you have any questions concerning the wage rates, please contact IDOT's Chief Contract Official at 217-782-7806.