

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. This does not apply to Small Business Set-Asides.

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. This does not apply to Small Business Set-Asides.

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. These documents must be received three days before the letting date.

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 server e-mails 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 D&Econtracts@dot.il.gov

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

BID SUBMITTAL GUIDELINES AND CHECKLIST

In an effort to eliminate confusion and standardize the bid submission process the Contracts Office has created the following guidelines and checklist for submitting bids.

This information has been compiled from questions received from contractors and from inconsistencies noted on submitted bids. If you have additional questions please refer to the contact information listed below.

ABOUT SUBMITTING BIDS: It is recommended that bidders deliver bid proposals in person to ensure they arrive at the proper location prior to the time specified for the receipt of bids. Any proposals received at the place of letting after the time specified will not be read.

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. This page has the Item number 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 after you are awarded the contract.
- 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.

Use the following checklist to ensure completeness and the correct order in assembling your bid

Illinois Office Affidavit (Not applicable to federally funded projects) insert your affidavit after page 4 along with your Cost Adjustments for Steel, Bituminous and Fuel (if applicable).

Cover page (the sheet that has the item number on it) **followed by your bid (the 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). Include the subcontractor(s) name, address, general type of work to be performed and the dollar amount (if over \$50,000). If you will use subcontractor(s) but are uncertain who or the dollar amount; check “YES” but leave the lines blank.

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 Union Local Name and number or certified training programs that you have in place. **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 Form A that is filled out.

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 financial 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 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 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”.

Bid Bond – Submit your bid bond using the current Bid Bond Form provided in the proposal package. The Power of Attorney page should be stapled to the Bid Bond. If you are using an electronic bond, include your bid bond number on the form and attach the Proof of Insurance printed from the Surety 2000 Web Site.

Disadvantaged Business Utilization Plan and/or Good Faith Effort – The last item 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 for a Good Faith Effort, it should 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 10:20 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 page of the current letting.

QUESTIONS: pre-letting up to execution of the contract

Contractor/Subcontractor 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

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

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RETURN WITH BID

Proposal Submitted By
Name
Address
City

Letting September 21, 2012

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. This does not apply to Small Business Set-Asides.

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. 63715
COOK County
Section 10-B5159-00-TL (Loyola University)
Route FAU 2865 (Sheridan Road)
Project HPP-4072(001)
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

Checked by

F

(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. 63715
COOK County
Section 10-B5159-00-TL (Loyola University)
Project HPP-4072(001)
Route FAU 2865 (Sheridan Road)
District 1 Construction Funds**

Project consists of roadway resurfacing with intersection improvements which includes ADA ramps, traffic signal modernization, concrete curb and gutter removal and replacement, sidewalk reconstruction, constructing planters at designated locations, roadway lighting, construction of a plaza, drainage improvements, landscaping and all other incidental items to complete the work on FAU Route 2865 (Sheridan Road) at Loyola Avenue at Loyola University.

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 shall govern performance and payments.

RETURN WITH BID

3. **ASSURANCE OF EXAMINATION AND INSPECTION/WAIVER.** The undersigned 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 proposal he/she waives all right to plead any misunderstanding regarding the same.

4. **EXECUTION OF CONTRACT AND CONTRACT BOND.** The undersigned 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, 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 \$10,000	\$300	\$3,000,000	to	\$5,000,000	\$150,000
\$10,000	to \$50,000	\$1,000	\$5,000,000	to	\$7,500,000	\$250,000
\$50,000	to \$100,000	\$3,000	\$7,500,000	to	\$10,000,000	\$400,000
\$100,000	to \$150,000	\$5,000	\$10,000,000	to	\$15,000,000	\$500,000
\$150,000	to \$250,000	\$7,500	\$15,000,000	to	\$20,000,000	\$600,000
\$250,000	to \$500,000	\$12,500	\$20,000,000	to	\$25,000,000	\$700,000
\$500,000	to \$1,000,000	\$25,000	\$25,000,000	to	\$30,000,000	\$800,000
\$1,000,000	to \$1,500,000	\$50,000	\$30,000,000	to	\$35,000,000	\$900,000
\$1,500,000	to \$2,000,000	\$75,000	over		\$35,000,000	\$1,000,000

Bank cashier's checks or properly certified checks accompanying proposals shall be made payable to the Treasurer, State of Illinois, when the state is awarding authority; the county treasurer, when a county is the awarding authority; or the city, village, or town treasurer, when a city, village, or town is the awarding authority.

If a combination bid is submitted, the proposal guaranties which accompany the individual 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 shall fail to execute a contract bond as required herein, it is hereby agreed that the amount of the proposal guaranty shall 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 shall become void or the proposal guaranty check shall 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 proposals, the amount must be equal to the sum of the proposal guaranties which would be required for each individual proposal. If the guaranty check is placed in another proposal, state below where it may be found.	
The proposal guaranty check will be found in the 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 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 proposal 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 shall 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. **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)

10. **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.

STATE JOB # - C-91-463-12
 PPS NBR -

COUNTY NAME	CODE	DIST	SECTION NUMBER	PROJECT NUMBER	ROUTE
COOK	031	01	10-B5159-00-TL (LOYOLA UNIV)	HPP-4072/001/000	FAU 2865

ITEM NUMBER	PAY ITEM DESCRIPTION	UNIT OF MEASURE	QUANTITY	UNIT PRICE		TOTAL PRICE	
				DOLLARS	CENTS	DOLLARS	CTS
A2002320	T-BETULA NIGRA 2-1/2	EACH	4.000 X				
A2004630	T-GLEDIT TRI VIN 4	EACH	6.000 X				
B0001720	T-AMEL X GF AP SF 12'	EACH	3.000 X				
C2C03523	S-HYDRA PANI LL 2.5'C	EACH	7.000 X				
C2C09520	S-SALIX PURP NAN 24C	EACH	3.000 X				
D2000730	E-JUNI CH SAR V 2.5'	EACH	28.000 X				
D2002650	E-PINUS MUG PM 4.5'	EACH	4.000 X				
D2003780	E-THUJA OCC SMARAG 9'	EACH	2.000 X				
E20021G3	V-C RAD CULT 3G	EACH	24.000 X				
E20090P9	V-EUONY FORT COL 2.5P	EACH	216.000 X				
K0012990	P PL ORNAMENT T GAL P	UNIT	2.000 X				
K0013020	P PL PRAIRIE TY GAL P	UNIT	1.000 X				
K1001988	IRRIGATION SYSTEM SPL	L SUM	1.000 X				
XX003663	PED SH 1F BM CNTDN T	EACH	8.000 X				
XX005425	LANDSCAPE BOLLARDS	EACH	8.000 X				

ITEM NUMBER	PAY ITEM DESCRIPTION	UNIT OF MEASURE	QUANTITY	UNIT PRICE		TOTAL PRICE	
				DOLLARS	CENTS	DOLLARS	CTS
XX005967	TOPSOIL PLANT MIXTURE	CU YD	227.000 X	=		=	
XX006821	CONC TRUCK WASHOUT	L SUM	1.000 X	=		=	
XX007163	INTER EX COND LT CONT	EACH	2.000 X	=		=	
XX007326	VEGETATV SCREEN PANEL	SQ FT	1,244.000 X	=		=	
XX007399	MONUMENT TY A FOUNDTN	EACH	2.000 X	=		=	
XX007638	CONN EX HANDHOLE VALT	EACH	8.000 X	=		=	
XX007711	CON G 3 GALVS	FOOT	213.000 X	=		=	
XX008127	STAMPED ASPHALT	SQ YD	294.000 X	=		=	
XX008258	STAMP COL PCC SDWLK 6	SQ FT	1,735.000 X	=		=	
XX008709	BASE BALL HOUS STL 7G	EACH	2.000 X	=		=	
XX008710	CON F 24 1 1/4A 15B 9	EACH	1.000 X	=		=	
XX008711	CON F 24 1 1/4A 15B 7	EACH	2.000 X	=		=	
XX008712	CON F30 1.25A 17.25B9	EACH	4.000 X	=		=	
XX008713	ELCBL C SIGNAL 14 19C	FOOT	679.000 X	=		=	
XX008714	ELCBL C SIGNAL 4 2C	FOOT	117.000 X	=		=	

ITEM NUMBER	PAY ITEM DESCRIPTION	UNIT OF MEASURE	QUANTITY	UNIT PRICE		TOTAL PRICE	
				DOLLARS	CENTS	DOLLARS	CTS
XX008715	EMB C P LOYOLA LED LM	EACH	4.000 X	=		=	
XX008716	LUM SL HPS 310W 240V	EACH	2.000 X	=		=	
XX008717	MAST ARM, STEEL, 15 F	EACH	6.000 X	=		=	
XX008718	MAST ARM STL MONO 16F	EACH	1.000 X	=		=	
XX008719	P S AB 11 3G 34"-6'	EACH	2.000 X	=		=	
XX008720	P S AB 8.5 3G 32'-6"	EACH	2.000 X	=		=	
XX008721	PERMEABLE CLAY PAVERS	SQ FT	3,710.000 X	=		=	
XX008722	PERF EXT STR VIT CP 8	FOOT	430.000 X	=		=	
XX008723	EXT STRNGTH VIT CP 12	FOOT	8.000 X	=		=	
XX008724	TR & BKFILL W SCREEN	FOOT	560.000 X	=		=	
XX008725	CONTR SL BM 1P 100AMP	EACH	1.000 X	=		=	
XX008726	POLY C HAND 12X18X12	EACH	1.000 X	=		=	
XX008727	CIRC B 1P 30AMP 600	EACH	1.000 X	=		=	
X0300635	PLANTER	EACH	2.000 X	=		=	
X0321309	CONCRETE PAD	SQ YD	13.000 X	=		=	

ITEM NUMBER	PAY ITEM DESCRIPTION	UNIT OF MEASURE	QUANTITY	UNIT PRICE		TOTAL PRICE	
				DOLLARS	CENTS	DOLLARS	CTS
X0322080	BUS SHELTER REM RELOC	EACH	1.000	X	=	=	=
X0322463	CONN TO EXIST SEWER	EACH	1.000	X	=	=	=
X0322689	P S AB 10 7G 34' -6"	EACH	2.000	X	=	=	=
X0322690	P S AB 10 3G 34' -6"	EACH	1.000	X	=	=	=
X0322792	BEDDING MATERIAL SPL	CU YD	17.000	X	=	=	=
X0323443	PREC MOD RET WALL	SQ FT	130.000	X	=	=	=
X0324994	ORNAMENTAL PLANTER	L SUM	1.000	X	=	=	=
X0325541	REM EX LIGHTING SYSTM	L SUM	1.000	X	=	=	=
X0326144	TAC/DET WARNING SURFC	SQ FT	108.000	X	=	=	=
X0326326	CC TPX 2-1/C6 1-1/CG	FOOT	565.000	X	=	=	=
X0326805	FOUNDATION REMOVAL	SQ FT	364.000	X	=	=	=
X0539800	TREE GRATES	EACH	2.000	X	=	=	=
X0935000	MA STL MONOTUBE 30	EACH	2.000	X	=	=	=
X3112900	SUB GRAN MAT SPL	CU YD	1,090.000	X	=	=	=
X4200408	PCC PVT 8 SPL	SQ YD	77.000	X	=	=	=

ITEM NUMBER	PAY ITEM DESCRIPTION	UNIT OF MEASURE	QUANTITY	UNIT PRICE		TOTAL PRICE	
				DOLLARS	CENTS	DOLLARS	CTS
X4200531	HES PCC PVT 8 SPL	SQ YD	354.000	X	=	=	=
X7010216	TRAF CONT & PROT SPL	L SUM	1.000	X	=	=	=
X8050095	SERV INSTALL SPL	EACH	1.000	X	=	=	=
X8210456	LM SL HPS400/240V ASC	EACH	4.000	X	=	=	=
X8570015	CONTROLLER (SPECIAL)	EACH	1.000	X	=	=	=
X8780105	CONC FDN SPL	EACH	1.000	X	=	=	=
Z0003850	BENCHES	EACH	7.000	X	=	=	=
Z0004002	BOLLARDS	EACH	8.000	X	=	=	=
Z0013798	CONSTRUCTION LAYOUT	L SUM	1.000	X	=	=	=
Z0022800	FENCE REMOVAL	FOOT	60.000	X	=	=	=
20100110	TREE REMOV 6-15	UNIT	30.000	X	=	=	=
20101000	TEMPORARY FENCE	FOOT	475.000	X	=	=	=
20101100	TREE TRUNK PROTECTION	EACH	8.000	X	=	=	=
20101700	SUPPLE WATERING	UNIT	5.000	X	=	=	=
20200100	EARTH EXCAVATION	CU YD	267.000	X	=	=	=

ITEM NUMBER	PAY ITEM DESCRIPTION	UNIT OF MEASURE	QUANTITY	UNIT PRICE		TOTAL PRICE	
				DOLLARS	CENTS	DOLLARS	CTS
21001000	GEOTECH FAB F/GR STAB	SQ YD	839.000 X	=	=	=	=
28200200	FILTER FABRIC	SQ YD	39.000 X	=	=	=	=
31101100	SUB GRAN MAT B	CU YD	127.000 X	=	=	=	=
40600100	BIT MATLS PR CT	GALLON	470.000 X	=	=	=	=
40600635	LEV BIND MM N70	TON	99.000 X	=	=	=	=
40600982	HMA SURF REM BUTT JT	SQ YD	54.000 X	=	=	=	=
40601005	HMA REPL OVER PATCH	TON	3.000 X	=	=	=	=
40603340	HMA SC "D" N70	TON	198.000 X	=	=	=	=
42001300	PROTECTIVE COAT	SQ YD	2,342.000 X	=	=	=	=
42400200	PC CONC SIDEWALK 5	SQ FT	6,360.000 X	=	=	=	=
44000158	HMA SURF REM 2 1/4	SQ YD	2,350.000 X	=	=	=	=
44000500	COMB CURB GUTTER REM	FOOT	307.000 X	=	=	=	=
44000600	SIDEWALK REM	SQ FT	6,658.000 X	=	=	=	=
44002209	HMA RM OV PATCH 2 1/4	SQ YD	21.000 X	=	=	=	=
44201761	CL D PATCH T1 10	SQ YD	3.000 X	=	=	=	=

ITEM NUMBER	PAY ITEM DESCRIPTION	UNIT OF MEASURE	QUANTITY	UNIT PRICE		TOTAL PRICE	
				DOLLARS	CENTS	DOLLARS	CTS
44201765	CL D PATCH T2 10	SQ YD	13.000 X	=		=	
44300200	STRIP REF CR CON TR	FOOT	200.000 X	=		=	
56400400	FIRE HYDNPTS RELOCATED	EACH	1.000 X	=		=	
60200205	CB TA 4 DIA T1F CL	EACH	1.000 X	=		=	
60603800	COMB CC&G TB6.12	FOOT	614.000 X	=		=	
66900200	NON SPL WASTE DISPOSL	CU YD	130.000 X	=		=	
66900450	SPL WASTE PLNS/REPORT	L SUM	1.000 X	=		=	
66900530	SOIL DISPOSAL ANALY	EACH	3.000 X	=		=	
67000400	ENGR FIELD OFFICE A	CAL MO	6.000 X	=		=	
67100100	MOBILIZATION	L SUM	1.000 X	=		=	
70300100	SHORT TERM PAVT MKING	FOOT	2,000.000 X	=		=	
72400500	RELOC SIN PAN ASSY TA	EACH	3.000 X	=		=	
78000100	THPL PVT MK LTR & SYM	SQ FT	77.000 X	=		=	
78000200	THPL PVT MK LINE 4	FOOT	758.000 X	=		=	
78000400	THPL PVT MK LINE 6	FOOT	189.000 X	=		=	

ITEM NUMBER	PAY ITEM DESCRIPTION	UNIT OF MEASURE	QUANTITY	UNIT PRICE		TOTAL PRICE	
				DOLLARS	CENTS	DOLLARS	CTS
78000650	THPL PVT MK LINE 24	FOOT	390.000 X	=		=	
81028170	UNDRGRD C GALVS 1	FOOT	193.000 X	=		=	
81603010	UD 2#10#10GXLPUSE 3/4	FOOT	342.000 X	=		=	
81702110	EC C XLP USE 1C 10	FOOT	160.000 X	=		=	
87301255	ELCBL C SIGNAL 14 7C	FOOT	615.000 X	=		=	
88040070	SH P LED 1F 3S BM	EACH	4.000 X	=		=	
88040090	SH P LED 1F 3S MAM	EACH	5.000 X	=		=	
89000100	TEMP TR SIG INSTALL	EACH	1.000 X	=		=	
89502375	REMOV EX TS EQUIP	EACH	1.000 X	=		=	

TOTAL \$

- NOTE:
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.

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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.

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

1. The Code provides in pertinent part:

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 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 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.

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2. 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 and Executive Order Number 3 (1998). Information concerning the exemption process is available from the Department upon request.

B. Negotiations

1. The Code provides in pertinent part:

Section 50-15. Negotiations.

(a) 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.

2. 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

1. The Code provides:

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.

2. 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

1. The Code provides:

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.

2. 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

1. The Code provides:

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.

2. 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

1. The Code provides:

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.

2. 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.

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G. Insider Information

1. The Code provides:

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.

2. 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.

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

1. The Code provides:

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 1961.

(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.

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

B. Felons

1. The Code provides:

Section 50-10. Felons. 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.

1. 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.

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C. Debt Delinquency

1. The Code provides:

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

1. The Code provides:

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 500/50-12 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

1. Section 3 of the Educational Loan Default Act provides:

§ 3. 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.

2. 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

1. Section 33E-11 of the Criminal Code of 1961 provides:

§ 33E-11. (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. The State and units of local government shall provide the appropriate forms for such certification.

- (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.

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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.

2. 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

1. Section 5 of the International Anti-Boycott Certification Act provides:

§ 5. State contracts. 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.

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

I. Drug Free Workplace

1. 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.

2. The bidder certifies that if awarded a contract in excess of \$5,000 it will provide a drug free workplace by:

(a) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensation, possession or use of a controlled substance, including cannabis, is prohibited in the contractor's workplace; specifying the actions that will be taken against employees for violations of such prohibition; and notifying the employee that, as a condition of employment on such contract, the employee shall abide by the terms of the statement, and notify the employer of any criminal drug statute conviction for a violation occurring in the workplace no later than five (5) days after such conviction.

(b) Establishing a drug free awareness program to inform employees about the dangers of drug abuse in the workplace; the contractor's policy of maintaining a drug free workplace; any available drug counseling, rehabilitation, and employee assistance programs; and the penalties that may be imposed upon employees for drug violations.

(c) Providing a copy of the statement required by subparagraph (1) to each employee engaged in the performance of the contract and to post the statement in a prominent place in the workplace.

(d) Notifying the Department within ten (10) days after receiving notice from an employee or otherwise receiving actual notice of the conviction of an employee for a violation of any criminal drug statute occurring in the workplace.

(e) Imposing or requiring, within 30 days after receiving notice from an employee of a conviction or actual notice of such a conviction, an appropriate personnel action, up to and including termination, or the satisfactory participation in a drug abuse assistance or rehabilitation program approved by a federal, state or local health, law enforcement or other appropriate agency.

(f) Assisting employees in selecting a course of action in the event drug counseling, treatment, and rehabilitation is required and indicating that a trained referral team is in place.

(g) Making a good faith effort to continue to maintain a drug free workplace through implementation of the actions and efforts stated in this certification.

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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, offer, or proposal 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.

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

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.

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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 business entity 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: _____

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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.

- Are you currently an officer or employee of either the Capitol Development Board or the Illinois State Toll Highway Authority? Yes ___ No ___
- 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. 63715
 COOK County
 Section 10-B5159-00-TL (Loyola University)
 Project HPP-4072(001)
 Route FAU 2865 (Sheridan Road)
 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

TABLE B

TOTAL Workforce Projection for Contract														
JOB CATEGORIES	TOTAL EMPLOYEES		MINORITY EMPLOYEES						TRAINEES					
			BLACK		HISPANIC		*OTHER MINOR.		APPREN-TICES		ON THE JOB TRAINEES			
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
OFFICIALS (MANAGERS)														
SUPERVISORS														
FOREMEN														
CLERICAL														
EQUIPMENT OPERATORS														
MECHANICS														
TRUCK DRIVERS														
IRONWORKERS														
CARPENTERS														
CEMENT MASONS														
ELECTRICIANS														
PIPEFITTERS, PLUMBERS														
PAINTERS														
LABORERS, SEMI-SKILLED														
LABORERS, UNSKILLED														
TOTAL														

CURRENT EMPLOYEES TO BE ASSIGNED TO CONTRACT				
TOTAL EMPLOYEES			MINORITY EMPLOYEES	
M	F		M	F

TABLE C

TOTAL Training Projection for Contract								
EMPLOYEES IN TRAINING	TOTAL EMPLOYEES		BLACK		HISPANIC		*OTHER MINOR.	
	M	F	M	F	M	F	M	F
APPRENTICES								
ON THE JOB TRAINEES								

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

FOR DEPARTMENT USE ONLY

Note: See instructions on page 2

RETURN WITH BID

**Contract No. 63715
COOK County
Section 10-B5159-00-TL (Loyola University)
Project HPP-4072(001)
Route FAU 2865 (Sheridan Road)
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. 63715
COOK County
Section 10-B5159-00-TL (Loyola University)
Project HPP-4072(001)
Route FAU 2865 (Sheridan Road)
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

DBE Participation Statement

Subcontractor Registration _____

Letting _____

Participation Statement

Item No. _____

(1) Instructions

Contract _____

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. 63715
COOK County
Section 10-B5159-00-TL (Loyola University)
Project HPP-4072(001)
Route FAU 2865 (Sheridan Road)
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

1. The Code provides:

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 1961.

(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.

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

B. Felons

1. The Code provides:

Section 50-10. Felons. 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.

2. 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

1. The Code provides:

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

1. The Code provides:

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 500/50-12 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.

Name of Subcontracting Company

Authorized Officer

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 ___

(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 ___

(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 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 ___

(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 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. This Form B must be completed for subcontracts with a total value of \$50,000 or more, from subcontractors identified in Section 20-120 of the Code, and for all open-ended contracts.

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: Signature of Authorized Officer, 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 at the Harry R. Hanley Building, 2300 South Dirksen Parkway, in Springfield, Illinois until 10:00 o'clock a.m. September 21, 2012. 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. 63715
COOK County
Section 10-B5159-00-TL (Loyola University)
Project HPP-4072(001)
Route FAU 2865 (Sheridan Road)
District 1 Construction Funds**

Project consists of roadway resurfacing with intersection improvements which includes ADA ramps, traffic signal modernization, concrete curb and gutter removal and replacement, sidewalk reconstruction, constructing planters at designated locations, roadway lighting, construction of a plaza, drainage improvements, landscaping and all other incidental items to complete the work on FAU Route 2865 (Sheridan Road) at Loyola Avenue at Loyola University.

- 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, 2012

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

SUPPLEMENTAL SPECIFICATIONS

Std. Spec. Sec.

Page No.

No Supplemental Specifications this year.

CHECK SHEET
RECURRING SPECIAL PROVISIONS

Adopted January 1, 2012

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

<u>CHECK SHEET #</u>	<u>RECURRING SPECIAL PROVISIONS</u>	<u>PAGE NO.</u>
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2	X Subletting of Contracts (Federal-Aid Contracts) (Eff. 1-1-88) (Rev. 5-1-93)	4
3	X EEO (Eff. 7-21-78) (Rev. 11-18-80)	5
4	Specific Equal Employment Opportunity Responsibilities Non Federal-Aid Contracts (Eff. 3-20-69) (Rev. 1-1-94)	15
5	Required Provisions - State Contracts (Eff. 4-1-65) (Rev. 1-1-12)	20
6	Asbestos Bearing Pad Removal (Eff. 11-1-03)	25
7	Asbestos Waterproofing Membrane and Asbestos Hot-Mix Asphalt Surface Removal (Eff. 6-1-89) (Rev. 1-1-09)	26
8	Haul Road Stream Crossings, Other Temporary Stream Crossings, and In-Stream Work Pads (Eff. 1-2-92) (Rev. 1-1-98)	27
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10	X Construction Layout Stakes (Eff. 5-1-93) (Rev. 1-1-07)	31
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16	X Patching with Hot-Mix Asphalt Overlay Removal (Eff. 10-1-95) (Rev. 1-1-07)	45
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22	Temporary Modular Glare Screen System (Eff. 1-1-00) (Rev. 1-1-07)	56
23	Temporary Portable Bridge Traffic Signals (Eff. 8-1-03) (Rev. 1-1-07)	58
24	Work Zone Public Information Signs (Eff. 9-1-02) (Rev. 1-1-07)	60
25	Night Time Inspection of Roadway Lighting (Eff. 5-1-96)	61
26	English Substitution of Metric Bolts (Eff. 7-1-96)	62
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29	Portland Cement Concrete Inlay or Overlay for Pavements (Eff. 11-1-08) (Rev. 1-1-12)	65
30	Quality Control of Concrete Mixtures at the Plant (Eff. 8-1-00) (Rev. 1-1-11)	68
31	Quality Control/Quality Assurance of Concrete Mixtures (Eff. 4-1-92) (Rev. 1-1-11).....	76

CHECK SHEET
LOCAL ROADS AND STREETS RECURRING SPECIAL PROVISIONS

Adopted January 1, 2012

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

<u>CHECK SHEET #</u>	<u>LOCAL ROADS AND STREETS RECURRING SPECIAL PROVISIONS</u>	<u>PAGE NO.</u>
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LRS 3	<input checked="" type="checkbox"/> Work Zone Traffic Control Surveillance (Eff. 1-1-99) (Rev. 1-1-10).....	91
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BDE SPECIAL PROVISIONS

INDEX LOCAL ROADS AND STREETS SPECIAL PROVISIONS

<u>LR #</u>	<u>Pg #</u>	<u>Special Provision Title</u>	<u>Effective</u>	<u>Revised</u>
LR SD12		<input type="checkbox"/> Slab Movement Detection Device	Nov. 11, 1984	Jan. 1, 2007
LR SD13		<input type="checkbox"/> Required Cold Milled Surface Texture	Nov. 1, 1987	Jan. 1, 2007
LR SD406		<input type="checkbox"/> Safety Edge	April 1, 2011	
LR 102-1		<input type="checkbox"/> Protests on Local Lettings	Jan. 1, 2007	Jan. 2, 2012
LR 102-2		<input type="checkbox"/> Bidding Requirements and Conditions for Contract Proposals	Jan. 1, 2001	Jan. 2, 2012
LR 102-3		<input type="checkbox"/> Bidding Requirements and Conditions for Material Proposals	Jan. 1, 2001	Jan. 2, 2012
LR 105	248	<input checked="" type="checkbox"/> Cooperation with Utilities	Jan. 1, 1999	Jan. 1, 2007
LR 107-2		<input type="checkbox"/> Railroad Protective Liability Insurance for Local Lettings	Mar. 1, 2005	Jan. 1, 2006
LR 107-4	251	<input checked="" type="checkbox"/> Insurance	Feb. 1, 2007	Aug. 1, 2007
LR 107-7		<input type="checkbox"/> Wages of Employees on Public Works	Jan. 1, 1999	Jan. 1, 2012
LR 108		<input type="checkbox"/> Combination Bids	Jan. 1, 1994	Mar. 1, 2005
LR 109		<input type="checkbox"/> Equipment Rental Rates	Jan. 1, 2012	
LR 212		<input type="checkbox"/> Shaping Roadway	Aug. 1, 1969	Jan. 1, 2002
LR 355-1		<input type="checkbox"/> Bituminous Stabilized Base Course, Road Mix or Traveling Plant Mix	Oct. 1, 1973	Jan. 1, 2007
LR 355-2		<input type="checkbox"/> Bituminous Stabilized Base Course, Plant Mix	Feb. 20, 1963	Jan. 1, 2007
LR 400-1		<input type="checkbox"/> Bituminous Treated Earth Surface	Jan. 1, 2007	Apr. 1, 2012
LR 400-2		<input type="checkbox"/> Bituminous Surface Plant Mix (Class B)	Jan. 1, 2008	
LR 400-3		<input type="checkbox"/> Hot In-Place Recycling (HIR) – Surface Recycling	Jan. 1, 2012	
LR 400-4		<input type="checkbox"/> Full-Depth Reclamation (FDR) with Emulsified Asphalt	June 1, 2012	
LR 400-5		<input type="checkbox"/> Cold In-Place Recycling (CIR) With Emulsified Asphalt	June 1, 2012	
LR 400-6		<input type="checkbox"/> Cold In Place Recycling (CIR) with Foamed Asphalt	June 1, 2012	
LR 400-7		<input type="checkbox"/> Full-Depth Reclamation (FDR) with Foamed Asphalt	June 1, 2012	
LR 402		<input type="checkbox"/> Salt Stabilized Surface Course	Feb. 20, 1963	Jan. 1, 2007
LR 403-1		<input type="checkbox"/> Surface Profile Milling of Existing, Recycled or Reclaimed Flexible Pavement	Apr. 1, 2012	Jun. 1, 2012
LR 403-2		<input type="checkbox"/> Bituminous Hot Mix Sand Seal Coat	Aug. 1, 1969	Jan. 1, 2007
LR 406		<input type="checkbox"/> Filling HMA Core Holes with Non-shrink Grout	Jan. 1, 2008	
LR 420		<input type="checkbox"/> PCC Pavement (Special)	May 12, 1964	Jan. 2, 2007
LR 442		<input type="checkbox"/> Bituminous Patching Mixtures for Maintenance Use	Jan. 1, 2004	Jun. 1, 2007
LR 451		<input type="checkbox"/> Crack Filling Bituminous Pavement with Fiber-Asphalt	Oct. 1, 1991	Jan. 1, 2007
LR 503-1		<input type="checkbox"/> Furnishing Class SI Concrete	Oct. 1, 1973	Jan. 1, 2002
LR 503-2		<input type="checkbox"/> Furnishing Class SI Concrete (Short Load)	Jan. 1, 1989	Jan. 1, 2002
LR 542		<input type="checkbox"/> Pipe Culverts, Type _____ (Furnished)	Sep. 1, 1964	Jan. 1, 2007
LR 663		<input type="checkbox"/> Calcium Chloride Applied	Jun. 1, 1958	Jan. 1, 2007
LR 702		<input type="checkbox"/> Construction and Maintenance Signs	Jan. 1, 2004	Jun. 1, 2007
LR 1000-1		<input type="checkbox"/> Cold In-Place Recycling (CIR) and Full Depth Reclamation (FDR) with Emulsified Asphalt Mix Design Procedures	June 1, 2012	
LR 1000-2		<input type="checkbox"/> Cold In-Place Recycling (CIR) and Full Depth Reclamation (FDR) with Foamed Asphalt Mix Design Procedures	June 1, 2012	
LR 1004		<input type="checkbox"/> Coarse Aggregate for Bituminous Surface Treatment	Jan. 1, 2002	Jan. 1, 2007
LR 1030		<input type="checkbox"/> Growth Curve	Mar. 1, 2008	Jan. 1, 2010
LR 1032-1		<input type="checkbox"/> Emulsified Asphalts	Jan. 1, 2007	Feb. 7, 2008
LR 1032-2		<input type="checkbox"/> Multigrade Cold Mix Asphalt	Jan. 1, 2007	Feb. 1, 2007
LR 1102		<input type="checkbox"/> Road Mix or Traveling Plan Mix Equipment	Jan. 1, 2007	

BDE SPECIAL PROVISIONS
For the August 3 and September 21, 2012 Lettings

The following special provisions indicated by an "X" are applicable to this contract. An * indicates a new or revised special provision for the letting.

File Name	Pg #		Special Provision Title	Effective	Revised
80240			Above Grade Inlet Protection	July 1, 2009	Jan. 1, 2012
80099			Accessible Pedestrian Signals (APS)	April 1, 2003	Jan. 1, 2007
80275	252	X	Agreement to Plan Quantity	Jan. 1, 2012	
80274			Aggregate Subgrade Improvement	April 1, 2012	Aug. 2012
80192			Automated Flagger Assistance Device	Jan. 1, 2008	
80173			Bituminous Materials Cost Adjustments	Nov. 2, 2006	Jan. 1, 2012
80241			Bridge Demolition Debris	July 1, 2009	
80276			Bridge Relief Joint Sealer (NOTE: This special provision was previously named "Concrete Joint Sealer")	Jan. 1, 2012	Aug. 2012
50261			Building Removal-Case I (Non-Friable and Friable Asbestos)	Sept. 1, 1990	April 1, 2010
50481			Building Removal-Case II (Non-Friable Asbestos)	Sept. 1, 1990	April 1, 2010
50491			Building Removal-Case III (Friable Asbestos)	Sept. 1, 1990	April 1, 2010
50531			Building Removal-Case IV (No Asbestos)	Sept. 1, 1990	April 1, 2010
80291			Calcium Chloride Accelerator for Class PP-2 Concrete	April 1, 2012	
80292			Coarse Aggregate in Bridge Approach Slabs/Footings	April 1, 2012	
80198			Completion Date (via calendar days)	April 1, 2008	
80199			Completion Date (via calendar days) Plus Working Days	April 1, 2008	
80293			Concrete Box Culverts with Skews > 30 Degrees and Design Fills ≤ 5 Feet	April 1, 2012	
80294			Concrete Box Culverts with Skews ≤ 30 Degrees Regardless of Design Fill and Skews > 30 Degrees with Design Fills > 5 feet	April 1, 2012	
80277			Concrete Mix Design - Department Provided	Jan 1, 2012	
80261	253	X	Construction Air Quality – Diesel Retrofit	June 1, 2010	
80237	256	X	Construction Air Quality – Diesel Vehicle Emissions Control	April 1, 2009	Jan. 2, 2012
80239	258	X	Construction Air Quality – Idling Restrictions	April 1, 2009	
80177			Digital Terrain Modeling for Earthwork Calculations	April 1, 2007	
80029	260	X	Disadvantaged Business Enterprise Participation	Sept. 1, 2000	Aug. 2, 2011
80272			Drainage and Inlet Protection Under Traffic	April 1, 2011	Jan. 1, 2012
80296	270	X	Errata for the 2012 Standard Specifications	April 1, 2012	Aug. 2012
80228			Flagger at Side Roads and Entrances	April 1, 2009	
80265	271	X	Friction Aggregate	Jan. 1, 2011	
80229			Fuel Cost Adjustment	April 1, 2009	July 1, 2009
80169			High Tension Cable Median Barrier	Jan. 1, 2007	April 1, 2009
80246	275	X	Hot-Mix Asphalt – Density Testing of Longitudinal Joints	Jan. 1, 2010	April 1, 2012
80109			Impact Attenuators	Nov. 1, 2003	Jan. 1, 2012
80110			Impact Attenuators, Temporary	Nov. 1, 2003	Jan. 1, 2012
80045			Material Transfer Device	June 15, 1999	Jan. 1, 2009
80203	277	X	Metal Hardware Cast into Concrete	April 1, 2008	Jan. 1, 2012
80297			Modified Urethane Pavement Marking	April 1, 2012	
80165			Moisture Cured Urethane Paint System	Nov. 1, 2006	Jan. 1, 2010
80253			Movable Traffic Barrier	Jan. 1, 2010	Jan. 1, 2012
80231			Pavement Marking Removal	April 1, 2009	
80298			Pavement Marking Tape Type IV	April 1, 2012	
80254	278	X	Pavement Patching	Jan. 1, 2010	
80022	279	X	Payments to Subcontractors	June 1, 2000	Jan. 1, 2006
80290			Payrolls and Payroll Records	Jan. 2, 2012	
80278	281	X	Planting Woody Plants	Jan. 1, 2012	Aug. 2012
80279	283	X	Portland Cement Concrete	Jan. 1, 2012	
80299			Portland Cement Concrete Inlay or Overlay	April 1, 2012	
80280	413	X	Portland Cement Concrete Sidewalk	Jan. 1, 2012	
80300			Preformed Plastic Pavement Marking Type D - Inlaid	April 1, 2012	
80218			Preventive Maintenance – Bituminous Surface Treatment	Jan. 1, 2009	April 1, 2012
80219			Preventive Maintenance – Cape Seal	Jan. 1, 2009	April 1, 2012

File Name	Pg #		Special Provision Title	Effective	Revised
80220			Preventive Maintenance – Micro-Surfacing	Jan. 1, 2009	April 1, 2012
80221			Preventive Maintenance – Slurry Seal	Jan. 1, 2009	April 1, 2012
80281	414	X	Quality Control/Quality Assurance of Concrete Mixtures	Jan. 1, 2012	
34261			Railroad Protective Liability Insurance	Dec. 1, 1986	Jan. 1, 2006
80157			Railroad Protective Liability Insurance (5 and 10)	Jan. 1, 2006	
80172			Reclaimed Asphalt Pavement (RAP)	Jan. 1, 2007	Aug. 1, 2012
80282			Reclaimed Asphalt Shingles (RAS)	Jan. 1, 2012	
80283			Removal and Disposal of Regulated Substances	Jan. 1, 2012	
80224			Restoring Bridge Approach Pavements Using High-Density Foam	Jan. 1, 2009	Jan. 1, 2012
80271			Safety Edge	April 1, 2011	
80152			Self-Consolidating Concrete for Cast-In-Place Construction	Nov. 1, 2005	April 1, 2012
80132	427	X	Self-Consolidating Concrete for Precast and Precast Prestressed Products	July 1, 2004	April 1, 2012
80284			Shoulder Rumble Strips	Jan. 1, 2012	
80285	429	X	Sidewalk, Corner or Crosswalk Closure	Jan. 1, 2012	
80127			Steel Cost Adjustment	April 2, 2004	April 1, 2009
80255			Stone Matrix Asphalt	Jan. 1, 2010	Jan. 1, 2012
80143	430	X	Subcontractor Mobilization Payments	April 2, 2005	April 1, 2011
80075			Surface Testing of Pavements	April 1, 2002	Jan. 1, 2007
80286			Temporary Erosion and Sediment Control	Jan. 1, 2012	
80225			Temporary Raised Pavement Marker	Jan. 1, 2009	
80256			Temporary Water Filled Barrier	Jan. 1, 2010	Jan. 1, 2012
80301			Tracking the Use of Pesticides	Aug. 1, 2012	
80287			Type G Inlet Box	Jan. 1, 2012	
80273	431	X	Traffic Control Deficiency Deduction	Aug. 1, 2011	
20338			Training Special Provisions	Oct. 15, 1975	
80270			Utility Coordination and Conflicts	April 1, 2011	Jan. 1, 2012
80288	432	X	Warm Mix Asphalt	Jan. 1, 2012	
80302	437	X	Weekly DBE Trucking Reports	June 1, 2012	
80289			Wet Reflective Thermoplastic Pavement Marking	Jan. 1, 2012	
80071			Working Days	Jan. 1, 2002	

The following special provisions are either in the 2012 Standard Specification, the 2012 Recurring Special Provisions, or the special provision Portland Cement Concrete:

File Name	Special Provision Title	New Location	Effective	Revised
80186	Alkali-Silica Reaction for Cast-in-Place Concrete	The special provision Portland Cement Concrete	Aug. 1, 2007	Jan. 1, 2009
80213	Alkali-Silica Reaction for Precast and Precast Prestressed Concrete	The special provision Portland Cement Concrete	Jan. 1, 2009	
80207	Approval of Proposed Borrow Areas, Use Areas, and/or Waste Areas	Article 107.22	Nov. 1, 2008	Nov., 1, 2010
80166	Cement	Section 1001	Jan. 1, 2007	April 1, 2011
80260	Certification of Metal Fabricator	Article 106.08	July 1, 2010	
80094	Concrete Admixtures	Section 1021 and the special provision Portland Cement Concrete	Jan. 1, 2003	April 1, 2009
80226	Concrete Mix Designs	The special provision Portland Cement Concrete	April 1, 2009	
80227	Determination of Thickness	Articles 353.12, 353.13, 353.14, 354.09, 355.09, 356.07, 407.10, 482.06 and 483.07	April 1, 2009	
80179	Engineer's Field Office Type A	Articles 670.02 and 670.07	April 1, 2007	Jan. 1, 2011
80205	Engineer's Field Office Type B	Articles 670.04 and 670.07	Aug. 1, 2008	Jan. 1, 2011
80189	Equipment Rental Rates	Articles 105.07 and 109.04	Aug. 2, 2007	Jan. 2, 2008
80249	Frames and Grates	Articles 609.02 and 609.04	Jan. 1, 2010	
80194	HMA - Hauling on Partially Completed Full-Depth Pavement	Article 407.08	Jan. 1, 2008	

<u>File Name</u>	<u>Special Provision Title</u>	<u>New Location</u>	<u>Effective</u>	<u>Revised</u>
80245	Hot-Mix Asphalt - Anti-Stripping Additive	Article 1030.04	Nov.1, 2009	
80250	Hot-Mix Asphalt - Drop-Offs	Article 701.07	Jan. 1, 2010	
80259	Hot-Mix Asphalt - Fine Aggregate	Articles 1003.01 and 1003.03	April 1, 2010	
80252	Improved Subgrade	Articles 302.04, 302.07 302.08, 302.10, 302.11 310.04, 310.08, 310.10 310.11 and 311.05	Jan. 1, 2010	
80266	Lane Closure, Multilane, Intermittent or Moving Operation, for Speeds < 40 MPH	Article 701.19	Jan.1, 2011	Jan. 2, 2011
80230	Liquidated Damages	Article 108.09	April 1, 2009	April 1, 2011
80267	Long-Span Guardrail over Culvert	Articles 630.07 and 630.08	Jan. 1, 2011	
80262	Mulch and Erosion Control Blankets	Articles 251.03, 251.04, 251.06, 251.07 and 1081.06	Nov. 1, 2010	April 1, 2011
80180	National Pollutant Discharge Elimination System / Erosion and Sediment Control Deficiency Deduction	Article 105.03	April 1, 2007	Nov. 1, 2009
80208	Nighttime Work Zone Lighting	Section 702	Nov.,1, 2008	
80232	Pipe Culverts	Article 542.03, 542.04, 542.11 and 1040.04	April 1, 2009	April 1, 2010
80263	Planting Perennial Plants	Section 254 and Article 1081.02	Jan. 1, 2011	
80210	Portland Cement Concrete Inlay or Overlay	Recurring CS #29	Nov. 1, 2008	
80217	Post Clips for Extruded Aluminum Signs	Article 1090.03	Jan. 1, 2009	
80268	Post Mounting of Signs	Article 701.14	Jan. 1, 2011	
80171	Precast Handling Holes	Articles 540.02, 540.06, 542.02, 542.04, 550.02, 550.06, 602.02, 602.07 and 1042.16	Jan. 1, 2007	
80015	Public Convenience and Safety	Article 107.09	Jan. 1, 2000	
80247	Raised Reflective Pavement Markers	Article 781.03	Nov. 1, 2009	April 1, 2010
80131	Seeding	Articles 250.07 and 1081.04	July 1, 2004	July 1, 2010
80264	Selection of Labor	Recurring CS #5	July 2, 2010	
80234	Storm Sewers	Article 550.02, 550.03, 550.06, 550.07, 550.08 and 1040.04	April 1, 2009	April 1, 2010
80087	Temporary Erosion Control	Articles 280.02, 280.03 280.04, 280.07, 280.08 and 1081.15	Nov.1, 2002	Jan. 1, 2011
80257	Traffic Barrier Terminal, Type 6	Article 631.07	Jan. 1, 2010	
80269	Traffic Control Surveillance	Article 701.10	Jan. 1, 2011	
80258	Truck Mounted/Trailer Mounted Attenuators	Articles 701.03, 701.15 and 1106.02	Jan. 1, 2010	

The following special provisions require additional information from the designer. The additional information needs to be included in a separate document attached to this check sheet. The Project Development and Implementation section will then include the information in the applicable special provision. The Special Provisions are:

- Bridge Demolition Debris
- Building Removal-Case I
- Building Removal-Case II
- Building Removal-Case III
- Building Removal-Case IV
- Completion Date
- Completion Date Plus Working Days
- DBE Participation
- Material Transfer Device
- Railroad Protective Liability Insurance
- Training Special Provisions
- Working Days

STATE OF ILLINOIS
SPECIAL PROVISIONS

The following Special provisions supplement the *Standard Specifications for Road and Bridge Construction*, adopted January 1, 2012, (hereinafter referred to as the Standard Specifications); the latest edition of the *Manual on Uniform Traffic Control Devices for Streets and Highways* the *Manual of Test Procedures for Materials* in effect on the date of invitation for bids; in effect on the date of invitations for bids; and the Supplemental Specifications and Recurring Special Provisions indicated on the check Sheet included herein which apply to and govern the construction of FAU 2865 (Sheridan Road from North of the CTA Track Crossing to South of Albion Avenue; Project No. HPP-4072(001), Section 10-B5159-00 TL, Cook County, IL, and in case of conflict with any part or parts of said Specifications, the said Special Provisions shall take precedence and shall govern.

F.A.U. 2865 (Sheridan Road)
Section: 10-B5159-00-TL
North of CTA Track Crossing to South of Albion Avenue
County: Cook
Contract 63715

LOCATION OF IMPROVEMENT

This improvement begins at a point on the alignment of Sheridan Road north of the CTA track over Sheridan Road structure and extends in a north direction towards Albion Avenue for a total distance of 373 feet (0.071 miles) along Sheridan Road. The improvement also includes the intersection of Sheridan Road, Loyola Avenue and a proposed connector/alley. This improvement is located within the City of Chicago in Cook County.

DESCRIPTION OF IMPROVEMENT

The work consists of roadway resurfacing with intersection improvements, which include ADA ramps and traffic signal modernization. Also included will be concrete curb and gutter removal and replacement, sidewalk reconstruction, constructing planters at designated locations, and roadway lighting. The proposed west leg of the Sheridan Road/Loyola Avenue intersection will be composed of permeable pavement with underdrains. The building in the southwest quadrant will be removed by others. A plaza, allowing access to a future CTA station reconstruction by others, will be included in this contract. The plaza construction will include a paved walkway, lighting and landscaping. This project also includes drainage improvements, landscaping, and all incidental and collateral work necessary to complete the project as shown on the plans and as described herein. All work for this project will be in English units.

MAINTENANCE OF ROADWAYS (D1)

Effective: September 30, 1985
Revised: November 1, 1996

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

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

STATUS OF UTILITIES TO BE ADJUSTED

Effective: January 30, 1987

Revised: July 1, 1994

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

<u>Name of Utility</u>	<u>Type</u>	<u>Location</u>	<u>Estimated Dates for Start and Completion of Relocation or Adjustments</u>
Department of Water Management Mr. John Barbaro CTR Joint Venture Jardine Water Purification Plant 1000 E. Ohio Street Chicago, IL 60611 312-744-5969	Sewer and Water	Sheridan Road	No Adjustments required (connections to water for irrigation and to sewer for drainage).
CDOT Division of Electrical Operations Mr. Christopher Hine 312-744-2450	Traffic Signals and Lighting	Sheridan Road	No adjustments required.

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.

CONTRACTOR COOPERATION

It is anticipated that this contract will be constructed concurrently with another project in the same area. This project that may be under contract concurrent with this project is as follows:

Loyola Station Improvements
CTA Contact: Mr. Richard Herndobler
Manager, Infrastructure Department
312-681-3921
Rherndobler@transitchicago.com

Project No. 12051
Improvement: Proposed building construction in the NW quadrant of the Sheridan Road/Loyola Avenue intersection

The Contractor shall schedule the work in order to minimize any conflicts that may arise between contracts as specified in Article 105.08 of the Standard Specifications. No additional compensation will be allowed for delays or inconveniences resulting from activities of other Contractors.

COMPLETION DATE PLUS WORKING DAYS (D1)

Effective: September 30, 1985

Revised: January 1, 2007

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

"When a completion date plus working days is specified, the Contractor shall complete all contract items and safely open all roadways to traffic by 11:59 PM on April 15, 2013, except as specified herein.

The Contractor will be allowed to complete all clean-up work and punch list items within 12 working days after the completion date. 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. These items of work will include the landscaping of the Plaza.

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.

RESTRICTION ON WORKING DAYS AFTER A COMPLETION DATE (D1)

Effective: January 21, 2003

Revised: January 1, 2007

All temporary lane closures 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 Open Traffic Lanes to Traffic. Should the Contractor fail to completely open and keep open all the traffic lanes to traffic in accordance with the limitations specified above, the Contractor shall be liable and shall pay to the Department the amount of \$250 per lane blocked, 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. The Department may deduct such damages from any monies due the Contractor. These damages shall apply during the period governed by working days after a completion date and any extensions of that contract time.

TRAFFIC CONTROL PLAN (D1)

Effective: September 30, 1985

Revised: January 1, 2007

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

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

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

STANDARDS:

701606-08	URBAN LANE CLOSURE, MULTILANE, 2W WITH MOUNTABLE MEDIAN
701801-05	SIDEWALK, CORNER OR CROSSWALK CLOSURE
701901-01	TRAFFIC CONTROL DEVICES

DETAILS:

- TC-10 TRAFFIC CONTROL AND PROTECTION FOR SIDE ROADS, INTERSECTIONS AND DRIVEWAYS
- TC-18 SIGNING FOR FLAGGING OPERATIONS AT WORK ZONE OPENINGS
- TC-22 ARTERIAL ROAD INFORMATION SIGN
- TC 24 CITY OF CHICAGO TYPICAL PAVEMENT MARKINGS (SHEETS 1 AND 2)

SPECIAL PROVISIONS:

TRAFFIC CONTROL AND PROTECTION, SPECIAL
MAINTENANCE OF ROADWAYS
CONTRACTOR COOPERATION

TRAFFIC CONTROL AND PROTECTION, SPECIAL

Work under this item will be performed in accordance with Section 701 of the Standard Specifications.

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

General Requirements. Traffic Control will be in accordance with the applicable sections of the Standard Specifications, the applicable guidelines contained in the Illinois Manual on Uniform Traffic Control Devices for Streets and Highways, the Special Provision, Interim Special Provisions and any Special Details and Highway Standards contained herein and in the plans.

At the preconstruction meeting the Contractor will furnish the name of the individual in his/her direct employ who is to be responsible for the installation and maintenance of the traffic control for this project. If the actual installation and maintenance are to be accomplished by a subcontractor, consent will be requested of the Department and County at the time of the preconstruction meeting in accordance with Article 108.01 of the Standard Specifications. This will not relieve the Contractor of the foregoing requirement for a responsible individual in his/her direct employ. The

Department will provide to the Contractor the name of its representative who will be responsible for the administration of the Traffic Control Plan. The Contractor will notify the District One Bureau of Traffic 72 hrs. before commencing construction for changing traffic flow.

The Contractor shall be responsible for the proper location, installation and arrangement of all traffic control devices as shown on the plans, or as directed by the Engineer. Special attention must be given to advance guide signs during these operations in order to keep barricade placement consistent with lane assignment. The Contractor will cover all traffic control devices which may be inconsistent with traffic patterns during the transfer from one construction stage to another.

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

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

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

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

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

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

The placement of barricades and warning signs for the required lane closures will be as specified herein and will proceed in the direction of the flow of traffic. The removal of all signs and barricades will begin at the end of the construction areas and proceed toward oncoming traffic.

Arrow Boards: A flashing arrow board meeting the requirements of Article 1106.03 of the Standard Specifications will be operating at all times when a lane is closed to traffic on a multilane highway. Arrow boards will be provided and located in ahead-on position within each lane closure taper. The cost of furnishing and maintaining arrow boards will be considered included in the contract lump sum price for TRAFFIC CONTROL AND PROTECTION, SPECIAL.

Traffic Control Highway Standards: Traffic Control Highway Standards 701606, 701801 and 701901 will not be paid for separately but shall be included in the contract lump sum price for TRAFFIC CONTROL AND PROTECTION, SPECIAL.

Revisions in the staging of construction, requested by the Contractor, may require traffic control to be installed according to 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. Any requested revisions, is approved by the Engineer, shall not be at any additional cost to the contract and considered included in the contract lump sum price for TRAFFIC CONTROL AND PROTECTION, SPECIAL.

Delays to the Contractor caused by complying with these requirements will be considered included in the cost of Traffic Control and Protection and no additional compensation will be allowed.

Method of Measurement. Traffic control and protection will be measured for payment on a lump sum basis.

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

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

Effective: May 1, 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.

RECLAIMED ASPHALT PAVEMENT AND SHINGLES (D-1)

Effective: January 1, 2012

Revise Section 1031 of the Standard Specifications to read:

“SECTION 1031. RECLAIMED ASPHALT PAVEMENT AND SHINGLES

1031.01 Description. RAP is reclaimed asphalt pavement resulting from cold milling and crushing of 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.

RAS is reclaimed asphalt shingles resulting from the processing and grinding of either preconsumer or post consumer shingles.

RAS shall be a clean and uniform material with a maximum of 0.5 percent unacceptable materials, as defined in Bureau of Materials and Physical Research Policy (BMPR) Memorandum *Reclaimed Asphalt Shingle (RAS) Sources*, by weight of RAS. All RAS used shall come from a BMPR approved processing facility.

RAS shall meet either Type 1 or Type 2 requirements as specified herein.

- (a) Type 1. Type 1 RAS shall be processed, preconsumer asphalt shingles salvaged from the manufacture of residential asphalt roofing shingles.
- (b) 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. The Contractor shall construct individual, sealed RAP or RAS stockpiles meeting one of the following definitions. No additional RAP or RAS 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. "crushed natural aggregate, ACBF and steel slag, crystalline structure or Type 2 RAS", etc...).

- (a) Fractionated RAP (FRAP). FRAP shall consist of RAP from Class I, Superpave (High ESAL), HMA (High ESAL), or equivalent mixtures. The coarse aggregate in FRAP shall be crushed aggregate and may represent more than one aggregate type and/or quality but shall be at least C quality. All FRAP shall be processed prior to testing and sized into fractions with the separation occurring on or between the #4 (4.75mm) and ½ in. (12.5mm) 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.
- (b) 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.
- (c) Conglomerate. Conglomerate RAP stockpiles shall consist of RAP from Class I, Superpave (High ESAL), HMA (High ESAL), or equivalent mixtures. The coarse aggregate in this RAP shall be crushed aggregate and may represent more than one aggregate type and/or quality but shall be at least C quality. This RAP may have an inconsistent gradation and/or asphalt binder content prior to processing. All 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.
- (d) Conglomerate "D" Quality (DQ). Conglomerate DQ RAP stockpiles shall consist of RAP from HMA shoulders, bituminous stabilized subbases or Superpave (Low ESAL)/HMA (Low ESAL) IL-19.0L binder mixture. The coarse aggregate in this RAP may be crushed or

processed (FRAP DQ) 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.

- (e) 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.

Type 1 and Type 2 RAS shall be stockpiled separately and shall not be intermingled. 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 shall be 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 3 years.

1031.03 Testing. When used in HMA, the RAS/RAP/FRAP shall be sampled and tested either during processing or after stockpiling.

- (a) RAS shall be sampled and tested as follows:

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 ton (900 metric ton) thereafter. A minimum of five tests are required for stockpiles less than 1000 ton (900 metric ton). Once a ≤ 1000 ton, five-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.

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)	$\pm 5 \%$
No. 16 (1.18 mm)	$\pm 5 \%$
No. 30 (600 μm)	$\pm 4\%$
No. 200 (75 μm)	$\pm 2.0 \%$
Asphalt Binder	$\pm 1.5 \%$

Parameter	RAS
Content	

(b)RAP/FRAP shall be sampled and tested as follows:

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).

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 restocking. The sampling plan shall meet the minimum frequency required above and detail the procedure used to obtain representative samples throughout the pile for testing.

All of the RAP/FRAP 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)		± 5 %
1/2 in. (12.5 mm)	± 8 %	± 15 %
No. 4 (4.75 mm)	± 6 %	± 13 %
No. 8 (2.36 mm)	± 5 %	
No. 16 (1.18 mm)		± 15 %
No. 30 (600 μm)	± 5 %	
No. 200 (75 μm)	± 2.0 %	± 4.0 %
Asphalt Binder	± 0.4 % ^{1/}	± 0.5 %
G_{mm}	± 0.03 ^{2/}	

1/ the tolerance for FRAP shall be ± 0.3 %

2/ for slag and steel slag

Before extraction, each field sample whether, RAS, 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.

If more than 20 percent of the individual sieves are out of the gradation tolerances, or if more than 20 percent of the asphalt binder content test results fall outside the appropriate tolerances, the RAS, RAP or FRAP shall not be used in HMA 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.

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

1031.04 Quality Designation of Aggregate in RAP/FRAP.

(a) The aggregate quality of the RAP, Fractionated RAP, Restricted FRAP, Conglomerate, and conglomerate "D" quality stockpiles shall be set by the lowest quality of coarse aggregate in the stockpile and are designated as follows:

- (1) RAP from Class I, Superpave (High ESAL)/HMA (High ESAL), or HMA (Low ESAL) IL-9.5L surface mixtures are designated as containing Class B quality coarse aggregate.
- (2) RAP from Superpave (Low 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), or HMA (High ESAL) binder mixtures, bituminous base course mixtures, and bituminous base course widening mixtures are designated as containing Class C quality coarse aggregate.
- (4) RAP from bituminous stabilized subbase and BAM shoulders are designated as containing Class D quality coarse aggregate.

(b) The aggregate quality of FRAP shall be determined as follows.

- (1) If the Engineer has documentation of the quality of the FRAP aggregate, the Contractor shall use the assigned quality provided by the Engineer. If the quality is not known, the quality shall be determined according to note (2) herein:
- (2) Fractionated RAP stockpiles containing plus #4 (4.75 mm) sieve coarse aggregate shall have a maximum tonnage of 5000 tons (4500 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.

1031.05 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.

The use of RAS shall be as follows:

Type 1 or Type 2 RAS may be used alone or in conjunction with, Fractionated Reclaimed Asphalt Pavement (FRAP) or Reclaimed Asphalt Pavement (RAP), in all HMA mixtures up to a maximum of 5.0 percent by weight of total mix.

Reclaimed asphalt shingles (RAS) meeting Type 1 or Type 2 requirements will be permitted in all HMA mixtures for overlay applications. RAS will also be permitted in all Low ESAL full depth

pavement and ALL other Mixtures (Stabilized Subbase and shoulder HMA). RAS shall not be used in full depth HMA High ESAL main line pavement.

The use of RAP/FRAP shall be as follows:

- (a) Coarse Aggregate Size (after extraction), The coarse aggregate in all RAP or FRAP shall be equal to or less than the maximum size requirement for the HMA mixture to be produced.
- (b) Steel Slag Stockpiles. RAP 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) surface mixtures only.
- (c) Use in HMA Surface Mixtures (High and Low ESAL). RAP/FRAP and Restricted FRAP stockpiles for use in HMA surface mixtures (High and Low ESAL) shall in which the coarse aggregate 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.
- (d) 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.
- (e) Use in Shoulders and Subbase. RAP/FRAP stockpiles for use in HMA shoulders and stabilized subbase (HMA) shall RAP, Restricted FRAP, Conglomerate, or Conglomerate DQ.

When the Contractor chooses the RAP option, 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 ^{1/, 3/} Ndesign	Maximum % Asphalt Binder replacement (ABR)		
	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

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 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 ^{1/, 2/}	Level 1 - Maximum % ABR			
	Ndesign	Binder/Leveling Binder	Surface	Polymer ^{3/, 4/} Modified
30L		35	30	15
50		30	25	15
70		30	20	15
90		20	15	15
105		20	15	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).

3/ For SMA, when the FRAP option is used, the maximum ABR is 15 percent. When the RAS option is used, the maximum ABR is 20 percent. When the asphalt binder replacement in SMA exceeds 10 percent, the high and low virgin asphalt binder grade shall each be reduced by one grade (i.e. 15 percent asphalt binder replacement would require a virgin asphalt binder grade of PG76-22 to be reduced to a PG70-28).

4/ For IL 4.75 mix, when the FRAP option is used, the maximum ABR is 15 percent. When the RAS option is used, the maximum ABR is 20 percent. When the RAS option is used, a maximum of 5 percent RAS by weight of the mix, shall be permitted. When the ABR in the IL-4.75 exceeds 15 percent, the high and low virgin asphalt binder grade shall each be reduced by one grade (i.e. 16 percent asphalt binder replacement would require a virgin asphalt binder grade of PG76-22 to be reduced to a 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 ^{1/, 2/}	Level 2 - Maximum % ABR			
	Ndesign	Binder/Leveling Binder	Surface	Polymer ^{3/, 4/} Modified
30L		40	40	20
50		40	30	20

HMA Mixtures ^{1/, 2/}	Level 2 - Maximum % ABR		
Ndesign	Binder/Leveling Binder	Surface	Polymer Modified ^{3/, 4/}
70	40	30	20
90	40	30	20
105	40	30	20

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/ For SMA, 20 percent ABR from RAS maybe combined with a maximum of 10 percent ABR from FRAP. When the asphalt binder replacement in SMA exceeds 10 percent, the high and low virgin asphalt binder grade shall each be reduced by one grade (i.e. 15 percent asphalt binder replacement would require a virgin asphalt binder grade of PG76-22 to be reduced to a PG70-28).

4/ For IL 4.75, a 20 percent ABR from RAS maybe combined with a maximum of 20 percent ABR from FRAP. When the asphalt binder replacement in the IL-4.75 exceeds 15 percent, the high and low virgin asphalt binder grade shall each be reduced by one grade (i.e. 16 percent asphalt binder replacement would require a virgin asphalt binder grade of PG76-22 to be reduced to a PG70-28).

1031.06 HMA Mix Designs. 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

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.

1031.07 HMA Production. All HMA mixtures shall be sampled within the first 500 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 Illinois Modified AASHTO T324 and shall meet the requirements specified herein. The production of such mixture, shall not exceed 1,500 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 is demonstrated prior to start of mix production for the 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.

HMA plants utilizing RAS, RAP and FRAP shall be capable of automatically recording and printing the following information.

(a) Dryer Drum Plants.

- (1) Date, month, year, and time to the nearest minute for each print.
- (2) HMA mix number assigned by the Department.
- (3) Accumulated weight of dry aggregate (combined or individual) in tons (metric tons) to the nearest 0.1 ton (0.1 metric ton).
- (4) Accumulated dry weight of RAS, RAP and FRAP in tons (metric tons) to the nearest 0.1 ton (0.1 metric ton).
- (5) Accumulated mineral filler in revolutions, tons (metric tons), etc. to the nearest 0.1 unit.
- (6) Accumulated asphalt binder in gallons (liters), tons (metric tons), etc. to the nearest 0.1 unit.
- (7) Residual asphalt binder in the RAS, RAP and FRAP material as a percent of the total mix to the nearest 0.1 percent.
- (8) When producing mixtures with FRAP and/or RAS, a positive dust control system shall be utilized.
- (9) Accumulated mixture tonnage.
- (10) Dust removed (accumulated to the nearest 0.1ton)
- (11) Aggregate RAS, RAP and FRAP moisture compensators in percent as set on the control panel. (Required when accumulated or individual aggregate and RAS, RAP FRAP are printed in wet condition.)

(b) Batch Plants.

- (1) Date, month, year, and time to the nearest minute for each print.
- (2) HMA mix number assigned by the Department.

- (3) Individual virgin aggregate hot bin batch weights to the nearest pound (kilogram).
- (4) Mineral filler weight to the nearest pound (kilogram).
- (5) RAS, RAP and FRAP weight to the nearest pound (kilogram).
- (6) Virgin asphalt binder weight to the nearest pound (kilogram).
- (7) 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.

1031.08 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.
- (c) 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."

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 1)1030
- (j) Temporary Rubber Ramps (Note 2)

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

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

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

Revise Article 603.07 of the Standard Specifications to read:

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

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

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

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

Placement shall be according to the manufacturer's specifications.

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

HOT MIX ASPHALT - MIXTURE DESIGN VERIFICATION AND PRODUCTION (BMPR)

Effective: January 1, 2012

Description. This special provision 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. This special provision also states the plant requirements for hydrated lime addition systems used in the production of High ESAL, IL-4.75, and SMA mixes.

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.

In addition to the requirements in the December 1, 2011 HMA Special Provisions for Pay for Performance Using Percent Within Limits, a Hamburg Wheel test and tensile strength test will be

conducted during mix design on mixtures used for Pay For Performance projects.

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 necessary changes to the mix and provide passing Hamburg Wheel and Tensile Strength test results from a private lab. The Department will verify the passing results.

All new and renewal mix designs shall meet the following requirements for verification testing.

(1) Hamburg Wheel Test criteria. The maximum allowable rut depth shall be 0.5 in. (12.5 mm). The minimum number of wheel passes at the 0.5 in. (12.5 mm) rut depth criteria shall be based on the high temperature binder grade of the mix as specified in the plans for the mix design.

PG Grade	Number of Passes
PG 64-xx (or lower)	10,000
PG 70-xx	15,000
PG 76-xx (or higher)	20,000

(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. A Hamburg Wheel test will be conducted on each High ESAL, IL-4.75, and SMA mix produced that has been verified by the Hamburg Wheel process.

The Contractor shall obtain a sample during the startup for each mix and compact gyratory specimens to the air void percentage as specified in IL-modified AASHTO T-324 to be provided to the Department for testing. The Department may conduct additional Hamburg Wheel Tests on production material as determined by the Engineer.”

System for Hydrated Lime Addition. Revise the last sentence of the third paragraph of Article 1030.04(c) of the Standard Specifications to read:

“The method of application shall be according to Article 1102.01(a)(10).”

Revise the first three sentences of the second paragraph of Article 1102.01(a)(10) of the Standard Specifications to read:

“When hydrated lime is used as the anti-strip additive, a separate bin or tank and feeder system shall be provided to store and accurately proportion the lime onto the

aggregate either as a slurry, as dry lime applied to damp aggregates, or as dry lime injected onto the hot aggregates prior to adding the liquid asphalt cement. If the hydrated lime is added either as a slurry or as dry lime on damp aggregates, the lime and aggregates shall be mixed by a power driven pugmill to provide a uniform coating of the lime prior to entering the dryer. If dry hydrated lime is added to the hot dry aggregates in a drum plant, the lime will be added in such a manner that the lime will not become entrained into the air stream of the dryer and that thorough dry mixing will occur prior to the injection point of the liquid asphalt. When a batch plant is used, the hydrated lime shall be added to the mixture in the weigh hopper or as approved by the Engineer.”

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

“For 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.

If an anti-stripping additive is required for any other HMA mix, the cost of the additive will be paid for according to Article 109.04. The cost incurred in introducing the additive into 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.”

FIRE HYDRANTS TO BE RELOCATED

Description. Work under this item includes, but is not limited to, furnishing all labor, equipment, and material necessary to complete the work as specified, shown on the Plans, or as directed by the Commissioner, and includes all excavation, backfill, removal of spoil, sheeting and bracing, removal of ground water, and polyethylene encasement.

Work under this item shall be performed in accordance with Section 564 of the Standard Specifications.

All work to be performed in making joints involved with the relocation of the existing fire hydrant must be done by a plumber, licensed in the City of Chicago or State of Illinois. The work shall include, but not limited to the removal of existing pipes, fittings, installation of gaskets, connecting the pipe and fittings, and the tightening of gland nuts and bolts.

New watermain needed for the relocation of an existing fire hydrants shall be included in this item.

Method of Measurement. Work under this item will be measured per each of FIRE HYDRANTS TO BE RELOCATED.

Basis of Payment. This work will be paid for at the contract unit price per each for FIRE HYDRANTS TO BE RELOCATED.

CONCRETE TRUCK WASHOUT

Description. CONCRETE TRUCK WASHOUT is used to contain concrete liquids when the chutes of concrete trucks are rinsed out after delivery of concrete to the construction site. These washout facilities function to consolidate solids for disposal and prevent runoff liquids associated with concrete. Details of the construction of the non portable facilities are included in the plans as "temporary concrete washout facilities". Failure to comply with appropriate washout location requirements will result in monetary deficiency deduction against the contractor.

General Requirements.

- The contractor must submit a plan of his/her proposed temporary concrete washout facility to the resident engineer for his/her approval at least 10 days prior to the first concrete pour.
- Temporary concrete washout facilities are to be in place before any delivery of concrete to the construction site.
- Temporary concrete washout facilities are to be located at least 50 feet from storm drain inlets, open drainage facilities, or water bodies. Each facility is to be located away from construction traffic or access areas to prevent disturbance or tracking.
- A sign is to be installed adjacent to each temporary concrete washout facility to inform concrete equipment operators of the designated washout facility.

DESIGN:

Two types of temporary concrete washouts are available for use on IDOT construction projects with details provided in the plans:

- Prefabricated Portable Facilities
 - Various products are now being marketed specifically for this purpose.
- Non-Portable Facilities – see details
 - Above Grade
 - Constructed using a barrier wall and polyethylene sheeting.
 - Barrier walls are constructed to create a berm, then lined with a single sheet of 10-mil. Polyethylene sheeting, which is free of holes, tears, or other defects which may compromise the impermeability of the material. Sandbags are used to hold the sheeting in place on top of the berm.
 - Sheeting must extend over entire basin and berm to prevent escape of discharge.
 - Below Grade
 - Constructed via excavation and the use of polyethylene sheeting and sandbags.
 - A pit is first excavated in a designated location and then lined with a single sheet of 10-mil polyethylene sheeting which is free of holes, tears, or other defects, which may compromise the impermeability of the material.
 - Sandbags are then to hold the sheeting in place.

SIZE OF WASHOUTS:

- The number and size of each washout facility is to be determined by the contractor. It is his/her responsibility to provide enough storage for the excess concrete and water produced on the target.

- Non-portable facilities are to have a minimum length and width of 10'.

INSPECTION/MAINTENANCE/REMOVAL:

- Temporary concrete washout facilities are to be inspected by the resident engineer during his/her weekly erosion and sediment control inspection, after a storm event of ½" or greater and at the end of any day when concrete has been poured on the construction site. The inspector is to ensure that there are no leaks, no spills, and that the facilities' capacity has not yet been compromised.
- Any overflowing of the washout facilities onto the ground must be cleaned up and removed within 24 hours of discovery.
- If a rain or snow event is forecasted, a non-collapsing, non-water collecting cover shall be placed over the washout facility and secured to prevent accumulation and overflow of precipitation.
- Contents of each concrete washout facility are not to exceed 75% of its designed capacity. If the contents reach 75% capacity, discontinue pouring concrete into the facility until it has been cleaned out.
- Allow slurry to evaporate or remove the site in a safe manner (i.e., vacuum truck). All hardened material can then be removed and disposed of properly.
- If a lined basin is used, immediately replace the liner if it becomes damaged.
- Remove temporary concrete washout facilities when they are no longer needed and restore the disturbed areas to their original condition.
- Note the locations of temporary concrete washout facilities and any changes to these facilities on the SWPPP.

Basis of Payment. The work shall be paid for at the contract unit price lump sum for CONCRETE TRUCK WASHOUT, which price shall be payment in full for all material, labor, excavation, inspection, and maintenance of the facility.

SUPPLEMENTAL WATERING

Scope. This work will include watering turf, trees, shrubs, and perennial plants at the rates specified and as directed by the Engineer.

Schedule. Watering will only begin after the successful completion of all period of establishment requirements. Supplemental watering should be used at any time after initial watering to keep turf, trees, shrubs and perennials in a live healthy condition while it is establishing.

Watering must be completed in a timely manner. When the Engineer directs the Contractor to do supplemental watering, the Contractor must begin the watering operation within 24 hours of notice. A minimum of 10 units of water per day must be applied until the work is complete. Damage to plant material that is a result of the Contractor's failure to water in a timely way must be repaired or replaced at the Contractor's expense.

Source of Water: The Contractor shall notify the Engineer of the source of water used and provide written certification that the water does not contain chemicals harmful to plant growth.

Rate of Application. The normal rates of application for watering are as follows. The Engineer will adjust these quantities and frequency rates as needed depending upon weather conditions.

Turf and Perennial Plants:	3 gallons per square foot
Trees:	30 gallons per tree
Shrubs:	8 gallons per shrub
Seedlings:	3 gallons per seedling
Ornamental Grasses:	3 gallons per square foot
Groundcovers and Vines:	3 gallons per square foot

Method of Application. A spray nozzle that does not damage small plants must be used when watering perennial plants or turf. Water shall be applied at the base of the plant to keep as much water as possible off plant leaves. An open hose may be used to water trees, shrubs, and seedlings if mulch and soil are not displaced by watering. The water shall be applied to individual plants in such a manner that the plant hole shall be saturated without allowing the water to overflow beyond the earthen saucer. Watering of plants in beds shall be applied in such a manner that all plant holes are uniformly saturated without allowing the water flow beyond the periphery of the bed.

Water shall trickle slowly into soil and completely soak the root zone. The Contractor must supply metering equipment as needed to assure the specified application rate of water.

Method of Measurement. Supplemental watering will be measured in units of 1000 gallons (3,785 liters) of water applied as directed.

Basis of Payment. This work will be paid for at the contract unit price per unit of SUPPLEMENTAL WATERING, measured as specified. Payment will include the cost of all water, equipment and labor needed to complete the work specified herein and to the satisfaction of the Engineer.

BOLLARDS

Description. This work shall consist of furnishing and installing bollards as shown in the plans and as specified herein.

Materials.

1. Heavy duty, round 6" diameter steel post.
2. Finish must be powder coated.
3. Color as specified on the plans.

Submittals. Submit the type of bollard and the manufacturer's literature including drawings or cut sheets, and a detailed installation specification for approval of the Engineer.

Construction Requirements. Verify layout information shown on the plans by performing field measurements. Examine and verify field conditions including utilities for area of installation and verify that the work may properly proceed. do not commence installation until unsatisfactory conditions have been corrected or the layout has been adjusted with the approval of the Engineer.

Method of Measurement. This Work will be measured for payment on a per each basis.

Basis of Payment. The work will be paid for at the contract unit price per each for BOLLARDS, which price will be payment in full for completing the Work as specified

STAMPED COLORED PORTLAND CEMENT CONCRETE SIDEWALK, 6 INCH

Description. This work applies to colored and stamped concrete surface in the plaza and consists of preparation of sub-base, forming, placing and finishing concrete as shown in the plans and as directed by the Engineer.

Submittals:

- (a) The following items shall be submitted and approved prior to operations: proposed concrete mix, color additive and stamp pattern.
- (b) A test section of 10 sq.ft. per color will be provided for evaluation by the Engineer. Sections shall be prepared with integral color, stamped with release agent, and coated with antiskid agent and sealer. Additional test section(s) will be provided if needed to achieve the desired quality.
- (c) The following items shall be submitted during operations: concrete load tickets and concrete sample test results.

Products:

- (a) Concrete: Portland cement concrete in compliance with SI in accordance with Section 1020-Portland Cement Concrete of IDOT Standard Specifications.
- (b) SGS Integral Color shall be fine ground pure mineral pigments, 338 Earthen and 385 Lava as detailed in the plans for the area of application, specifically designed for coloring concrete as manufactured by Solomon Colors, Inc., 4050 Color Plant Rd., Springfield, IL or approved equal.
- (c) Concrete Sealer shall be clear sealer (not amber) according to Section 1026 Standard Specifications.
- (d) Anti-Skid Agent shall be compatible with selected Sealer.
- (e) Stamp shall be as detailed in the plans.

Construction Requirements:

- (a) Construction shall be in compliance with Section 424 Portland Cement Concrete Sidewalk and these specifications.
- (b) Expansion joints shall be 1/2" thick, full depth 1/4" from the surface with sealer to fill the void.
- (c) Colored concrete shall be integrally and uniformly colored to achieve manufacturer's color guide.
- (d) Concrete surface shall be stamped to provide full depth impression. Color release agent

shall be used as detailed in the plans to achieve appearance to match the approved test section.

- (e) Surface shall have antiskid agent and sealer applied.
- (f) Final surface shall drain.
- (g) Upon completion, the contractor shall take particular care not to damage the pavement surface with other construction operations by covering the pavement with an appropriate protective cover material. Rollers, bituminous prime trucks, concrete trucks, and trucks carrying HMA will not be allowed to track over the pavement.

Basis of Payment. This work will be paid for at the contract unit price per square yard for STAMPED COLORED PORTLAND CEMENT CONCRETE SIDEWALK, 6 INCH which price shall include all equipment, materials, and labor, including base preparation, coloring, pouring and finishing/stamping, to complete this work as specified to the satisfaction of the Engineer.

SUBBASE GRANULAR MATERIAL (SPECIAL)

Description: This specification states the requirements for the coarse aggregate subbase material for use with porous and high albedo portland cement concrete for new driveway/alley pavement construction and permeable paver sidewalk.

Material: The aggregate material shall be uncrushed coarse gravel for locations with proposed PORTLAND CEMENT CONCRETE PAVEMENT, 8", (SPECIAL) pavement surface and PERMEABLE CLAY PAVERS.

Quality: The coarse aggregate shall be A Quality.

Gradation: The gradation for the subbase layer shall be 4" IDOT CA-7 over IDOT CA-1.

Preparation of Subbase: The coarse aggregate subbase shall be placed in 6-inch maximum lifts. Lightly compact each layer with equipment, keeping equipment movement over storage bed subgrade to a minimum. Should subbase material be disturbed due to construction equipment, the subbase layer shall be lightly regraded before laying the surface layer. Aggregate shall be placed to grades as indicated on the plans. Following placement of subbase aggregate, the geotechnical fabric shall be folded back along all bed edges to protect from sediment washout along bed edges. This edge strip shall remain in place until all bare soils contiguous to beds are stabilized and vegetated. In addition, take any other necessary steps to prevent sediment from washing into beds during site development. When the site is fully stabilized, temporary sediment control devices shall be removed.

Method of Measurement: SUBBASE GRANULAR MATERIAL (SPECIAL) will be measured for payment in place and the volume computed in cubic yards.

Basis of Payment: This work will be paid for at the contract unit price per cubic yard as shown in the Schedule of Unit Prices for SUBBASE GRANULAR MATERIAL (SPECIAL) which shall include the material needed to prepare the subgrade.

PORTLAND CEMENT CONCRETE PAVEMENT, 8" (SPECIAL)

Description: This specification states the requirements for a porous Portland cement concrete pavement of a high albedo, or light and heat reflective color, without reinforcement, constructed on a prepared subbase and subgrade, with or without forms. This item shall be used for alley pavement reconstruction only. In addition to the concrete, the work will include, but is not limited to, the furnishing and installation of all: joints with required fillers and dowel bars, and other appurtenant items required to construct the alley pavement.

General: Porous pavement areas shall not be used for equipment or materials storage during construction, and under no circumstances shall vehicles be allowed to deposit soil on paved porous surfaces.

Standard Specifications: All work shall be performed in accordance with section 420 of the Standard Specifications and Check Sheet 39 (QC/QA) except as specified herein.

Mock-Ups: A 15 ft. x 15 ft. x 8 in. paved area shall be installed as described in the following specification. This will allow the contractor to become familiar with working, batching, screeding and finishing porous concrete pavement. This area shall be the standard from which the work will be approved.

Materials: Materials shall meet the requirements of article 1020 for Class PV Concrete and the following. Dowel bars shall be in accordance with article 1006.11b of the Standard Specifications.

Aggregate: Aggregate shall be "A" Quality Dolomite aggregate only. Recycled aggregate is **NOT** allowed in the mix.

Cement: Cement shall be Portland Cement Type I with Ground Granulated Blast Furnace Slag or blended slag cements. Fly ash and/or additives that reduce the high albedo characteristics of the pavement are not allowed in the mix.

Admixtures: The mixture shall include admixtures for hydration stabilization and air-entrainment.

Water: Water used with cement in concrete, mortar, and water used for curing concrete shall be potable.

Mix Proportions and Mix Design: The Contractor may request that CDOT provide a mix design for the porous PCC mix. The contractor is responsible for selecting and furnishing all ingredient materials, including all admixtures. At no additional cost to the Contractor, CDOT will provide a mix design that complies with the specification and is verified via the IDOT Trial Mix (lab verification) procedure. The Contractor is responsible for the Trial Batch (plant) verification according to the IDOT QC/QA and Mix Design Procedures.

Should the contractor not request a mix design from CDOT, the Contractor shall furnish a proposed mix design according to the IDOT PCC Level III mix design manual.

The total cementitious material shall not be less than 525 pounds per cubic yard (lbs/yd³). The volume of aggregate per cubic yard shall be no less than 2400 pounds per cubic yard (lbs/yd³). Fine aggregates are not allowed in porous pavement. Allowed admixtures mentioned in the materials section shall be used strictly in accordance with the manufacturer's instructions and

recommendations. Mix water shall be such that the cement paste displays a wet metallic sheen without causing the paste to flow from the aggregate. The water to cement ratio shall be 0.30 ± 0.03 .

The mix aggregate gradation shall be IDOT CA-11, CA-13, CA-14, or CA-16

Unit Weight: The unit weight shall be between 110 and 125 pounds per cubic foot.

Concrete Strength: The porous concrete mix shall have a 28-day compressive strength of at least 2000 psi.

Quality Control: The contractor shall perform a minimum of one unit weight test for each one half day's production. Delivered Unit Weights are to be determined in accordance with ASTM C 29 using a 0.25 cubic foot cylindrical metal measure. The unit weight of the delivered concrete shall be between 100 and 125 pounds per cubic foot.

The contractor shall cut a minimum of three core samples for each 100 cubic yards of concrete from each alley location in accordance with ASTM C 42. A minimum of seven (7) days after placement of the pervious concrete is required before the cores can be taken. The cores shall be measured for thickness and unit weight. The average of all production cores shall not be less than the specified thickness with no individual core being more than $\frac{1}{2}$ inch less than the specified thickness.

After thickness determination, the cores shall be trimmed and measured for unit weight in the saturated condition according to ASTM C 140, Standard Methods of Testing Concrete Masonry Units. The trimmed cores shall be immersed in water for 24 hours, allowed to drain for (1) minute, surface water removed with a damp cloth, then weighed immediately. A range of satisfactory unit weight value is between 110 and 125 pounds per cubic foot. Core holes shall be filled with an IDOT approved non-shrink grout.

Construction Requirements:

Batching and Mixing: Mix water shall be such that the cement paste displays a wet metallic sheen without causing the paste to flow from the aggregate. A minimum of 20 revolutions at the manufacturer's designated mixing speed shall be required for any addition of water to the mix.

Transportation: The Portland cement aggregate mixture may be transported or mixed on site. If the mix is transported, it must be used **within 60 minutes** of the introduction of mix water. High ambient temperatures and windy conditions will have more pronounced effects relative to conventional pavements and shall be taken into account.

Placement and Consolidation: Under any circumstances, the pumping of porous concrete is prohibited. Placement shall be continuous, spreading and strikeoff shall be immediate. Screeding shall be done by hand with manual screeds. Mechanical (vibrating) screeds are **NOT** allowed. Edges near forms shall be compacted using a 1 ft by 1 ft steel tamp. **High ambient temperatures and windy conditions will have more pronounced effects relative to conventional pavements and shall be taken into account.**

Consolidation shall be accomplished by rolling over the porous concrete with a steel roller to the height of the forms. **Consolidation must be completed within 15 minutes of placement.**

Finishing: Porous pavements shall not be finished in the same way as traditional concrete pavements. Compaction or consolidation is the final step to finishing the concrete.

Joints: Joints shall be installed according to plan details. Joint installation shall be completed immediately after consolidation with a rolling joint tool. Dowels and tie bars shall be installed per the plan details. **Sawcutting of joints is prohibited.**

Curing: Curing procedures shall begin **within 20 minutes** after the final placement operations. The polyethylene sheeting method shall be used according to Article 1020.13 of the Standard Specifications. The cure time shall be a minimum of seven (7) days.

Opening to Traffic: The alley shall remain closed to all traffic for 10 continuous days from the start of curing.

Protection of Pavement: The Contractor shall protect the alley and its appurtenances against pedestrian traffic, public vehicular traffic and traffic caused by the Contractor's own employees and agents throughout the duration of the project. Erection and maintenance of standard warning signs, lights, barricades, etc shall be provided as shown on the plans.

Method of Measurement: PORTLAND CEMENT CONCRETE PAVEMENT, 8" (SPECIAL) will be measured for payment in place and the area computed in square yard.

Basis of Payment: This work will be paid for at the contract unit price per square yard as shown in the Schedule of Unit Prices for PORTLAND CEMENT CONCRETE PAVEMENT, 8" (SPECIAL). Subbase granular material shall be paid for at the unit price per cubic yard as shown in the Schedule of Unit Prices for SUBBASE GRANULAR MATERIAL (SPECIAL). The cost of all other materials, labor, equipment, tools and all incidental work necessary to construct the porous and high albedo concrete pavement shall be included in the pay item for PORTLAND CEMENT CONCRETE PAVEMENT, 8" (SPECIAL).

HIGH EARLY STRENGTH PORTLAND CEMENT CONCRETE PAVEMENT, 8" (SPECIAL)

Description: Work must consist of constructing a pavement composed of Portland cement concrete with or without reinforcement, constructed on a prepared subbase or subgrade, with or without forms. In addition to the concrete, the work will include, but is not limited to, the furnishing and installation of all joints: with required fillers and dowel bars, and other appurtenant items required for construction of the alley concrete pavement.

General Requirements: Alleys or driveways must not be poured monolithically with adjacent walks or curbs.

Standard Specifications: All work shall be performed in accordance with Section 420 of the Standard Specifications and BDE Special Provisions Check Sheet 53 (QC/QA) except as specified herein.

Materials: Materials shall meet the requirements of article 1020 and the Special Provision for Portland Cement Concrete patching (Class PP-3) and the following.

Mobile Mixer/Plant: The porous concrete mix shall be prepared and mixed on site. The Mobile Portland Cement Concrete Plant shall be in accordance with article 1103.04 of the Standard Specifications.

Aggregate: Aggregate shall be "A" Quality Dolomite aggregate only. Approved recycled aggregate shall be incorporated into the manufacturing of the concrete pavement and shall be in accordance with the quality stated in article 1004.01b of the Standard Specifications.

Cement: Cement shall be Portland Cement Type I with Ground Granulated Blast Furnace Slag or blended slag cements. Fly ash and/or additives that reduce the high albedo characteristics of the pavement are not allowed in the mix.

Accelerating admixtures are not allowed in the mix.

High Early Strength: The Cement Factor shall be a minimum of 7.35 cwt. The mix shall be designed according to Section 3.0 of the IDOT QC/QA PCC Level III Technician Manual. High early strength and high albedo concrete must achieve a minimum compressive strength of 3500 psi within 3 days of placement.

Method of Measurement: HIGH EARLY STRENGTH PORTLAND CEMENT CONCRETE PAVEMENT, 8" (SPECIAL) will be measured for payment in square yards, according to Article 420.20 in the Standard Specifications, except the application of protective coat will not be measured separately but will be considered incidental to this item.

Basis of Payment: The work under this item will be paid for at the contract unit price per square yard as shown in the Schedule of Unit Prices HIGH EARLY STRENGTH PORTLAND CEMENT CONCRETE PAVEMENT, 8" (SPECIAL) which price will include all costs in full for materials, labor, equipment, tools and all incidental work necessary, according to Article 420.20 in the Standard Specifications.

SUBBASE GRANULAR MATERIAL, TYPE B

Description: Work under this item shall be performed in accordance with the applicable articles of Section 311 of the Standard Specifications except as herein modified. This work shall consist of furnishing, placing and compacting granular material on the prepared subgrade to the thickness required per the plans.

General Requirements: The material shall have a CA-6 gradation conforming to Article 1004.04 of the SSRBC.

As an alternative, the material shall be Reclaimed Asphalt Pavement (RAP) meeting the DI Specification for Reclaimed Asphalt Pavement and Shingles. RAP shall not contain steel slag or other expansive material. The RAP shall be processed according to the IDOT quality control program for RAP.

The subbase granular material shall not be placed on a wet subgrade, a subgrade rutted by the Contractor's equipment, or a non-compacted and "Proof-rolled" subgrade.

Compaction: A vibratory roller meeting the requirements of Article 1101.01 or other compaction equipment approved by the Engineer shall be used to obtain the desired keying or interlock and necessary compaction. The Engineer will verify that adequate keying has been obtained.

Preparation of Subgrade: The subgrade shall be prepared. Preparation of the subgrade shall not be paid for separately but considered incidental to SUBBASE GRANULAR MATERIAL, TYPE B.

It is understood that a certain amount of subbase granular material may be displaced into the existing soil when the material is placed and compacted; however, any such material will not be measured for payment and the cost there of considered incidental to the item.

The Contractor will be required to drain off all rainfall as rapidly as possible and maintain the subgrade in a dry, smooth and compacted condition until the granular material is placed.

The Engineer may restrict hauling over the completed or partially completed work after inclement weather or at any time when the earth subgrade is soft and there is a tendency for the earth to work into the granular material.

Method of Measurement: The aggregate will be measured in place and the area computed in cubic yards. The area for measurement will be the lesser of the dimensions shown on the plans or as measured in the field.

Basis of Payment: This work shall be paid for at the contract unit price per cubic yard for SUBBASE GRANULAR MATERIAL TYPE B which price shall include furnishing, placing and compacting; and subgrade preparation.

LANDSCAPE BOLLARDS

Description. This work shall consist of furnishing and installing an aluminum bollard, with an internal LED luminaire. This work shall also consist of a 7" Dia x 12" deep foundation for the bollard.

Materials. Materials shall be the following, or equal approved by the Engineer:

Bega part numbers: 8619LED
895A anchorage kit

Construction Requirements. Installation shall be according to Sections 821, and 836 except that the foundation shall be flush with the proposed plaza surface.

Method of Measurement. This work shall be measured as Each, in place, and include all work and materials incidental to the proper installation of the item.

Basis of Payment. This work will be paid for at the contract unit price each for LANDSCAPE BOLLARDS.

EMBEDDED CONCRETE POLE, WITH LOYOLA LED LUMINAIRE

Description. This work shall consist of furnishing and installing an embedded concrete pole, with a LED post top luminaire.

Materials. Materials shall be the following, or equal approved by the Engineer:

Pole: Ameron Victorian V Pole, embedded style, with a 12'-0" pole height, and 5'-0" embedded depth.

Luminaire: Sternberg model 1335LED/4ARC45T5/ML/WA/VG, with "Loyola" custom slip fitter.

Construction Requirements. Installation shall be according to Sections 821, and 830.

Method of Measurement. This work shall be measured as Each, in place, and include all work and materials incidental to the proper installation of the item.

Basis of Payment. This work will be paid for at the contract unit price each for EMBEDDED CONCRETE POLE, WITH LOYOLA LED LUMINAIRE.

PERMEABLE CLAY PAVERS

Description: This specification states the requirements for a permeable clay paver pavement constructed on aggregate bedding, a prepared subbase and a prepared subgrade layer. This item shall be used for the Plaza adjacent to the stamped concrete.

General: Porous pavement areas shall not be used for equipment or materials storage during construction, and under no circumstances shall vehicles be allowed to deposit soil on paved porous surfaces.

Quality Assurance: Installation shall be by a Contractor and crew with at least one year of experience in placing permeable clay pavers on projects of similar size. The Contractor shall conform to all local, state/provincial licensing and bonding requirements.

Mock-Ups: A 9 ft. x 9 ft. paver area shall be installed as described in the following specification. This area will be used to determine joint sizes, lines, laying pattern(s), color(s), and texture of the project. This area shall be the standard from which the work will be approved. Final layout of permeable clay pavers shall be approved by the Engineer.

Delivery, Storage, and Handling: Concrete pavers shall be delivered to the site in steel banded, plastic banded, or plastic wrapped cubes capable of transfer by fork lift or clamp lift. The pavers shall be unloaded at the job site in such a manner that no damage occurs to the product. Delivery and paving schedules shall be coordinated in order to minimize interference with normal use of buildings adjacent to paving.

Environmental Conditions: Bedding aggregates and/or pavers shall not be installed during heavy rain or snowfall. Bedding aggregates and/or pavers shall not be installed over frozen base materials. Frozen bedding aggregates are prohibited from being installed.

Materials:

Permeable Clay Pavers: Permeable Clay Pavers shall conform with the geometric design, depth and physical configuration as specified on the bid plans. Permeable clay pavers shall have spacer bars on each unit. These spacer bars insure a precise joint spacing between all paving stones. The spacer bars permit the use of mechanical installation equipment for a mechanized installation process. The spacing shall be 3/8 inch.

Acceptable manufacturer for PERMEABLE CLAY PAVERS is specified below or approved equal:

Permeable Boardwalk Clay Brick Paver manufactured by:

Whitacre Greer
1400 S. Mahoning Avenue

Alliance, OH 44601

Color: The color shall be Majestic #52.

Subgrade and Subbase: The subbase layer shall be in accordance with the specification for SUBBASE GRANULAR MATERIAL (SPECIAL).

Edge Restraints: The provision of suitable edge restraints is critical to the satisfactory performance of interlocking concrete block pavement. The edge restraints shall be the Snap Edge Paver Restraint in 8 foot sections or approved equal.

Execution:

Site Preparation: The Contractor shall insure that the prepared subgrade is protected from damage from inundation by surface water. No traffic shall be allowed to cross the prepared subgrade. Repair of any damage resulting shall be the responsibility of the Contractor and shall be repaired. Under no circumstances shall further pavement construction proceed until the subgrade has been inspected by the Engineer.

Granular Subbase and Base Installation: The subbase shall be in accordance with the specification for SUBBASE GRANULAR MATERIAL (SPECIAL). The bedding base shall be placed above the subbase in accordance with the specification for BEDDING MATERIAL (SPECIAL).

Paver Installation: The bedding aggregate shall be spread evenly over the subbase course and screed to nominal 1.5 in. thickness. The subbase shall be SUBBASE GRANULAR (SPECIAL), consisting of 4 inches CA-7 over 6 inches CA-1. The bedding aggregate shall not be disturbed. Sufficient bedding aggregate shall be placed to stay ahead of the laid pavers. Under no circumstances, shall the bedding aggregate be used to fill depressions in the base surface. Initiation of paver placement shall be deemed to represent acceptance of the pavers. Pavers shall be free of foreign material before installation. Pavers shall be inspected for color distribution and all chipped, damaged or discolored pavers shall be replaced. Maximum allowable breakage is 5%. The pavers shall be laid in pattern(s) as specified by the manufacturer. Joints between the pavers shall be maintained according to the spacer bars. Gaps at the edges of the paved area shall be filled with cut pavers. Units shall not be cut smaller than one-third of a whole paver along edges subject to vehicular traffic. Pavers to be placed along the edge shall be cut with a masonry saw. The use of infill concrete or discontinuities in patterns will not be permitted except along the outer pavement boundaries, adjacent to drains and manholes. Upon completion of cutting, the area must be swept clean of all debris to facilitate inspection and to ensure pavers are not damaged during compaction. A low amplitude, high frequency plate compactor capable of 5,000 lbs compaction at 75-100 hertz frequency shall be used to compact the pavers. A urethane plate compactor pad shall be used to minimize any scuffing of the paving stone surface. The pavers shall be compacted and the bedding aggregates shall be swept into all joints and void openings until they are full, which will require the compactor to pass at least two or three passes to achieve. No compaction shall be performed within 3 ft. of the unrestrained edges of the paving units. All work to within 3 ft. of the laying face must be left fully compacted at the completion of each day. Excess surface bedding and void opening aggregates shall be swept off when the job is complete. The final surface elevations shall not deviate, as an example, more than 3/8 in. under a 10 ft. long straight edge. The surface elevation of pavers shall be 1/8 to 1/4 in. above adjacent drainage inlets, concrete collars or channels. The void opening aggregates shall comply with the BEDDING MATERIAL (SPECIAL) specification.

Field Quality Control: Final elevations shall be checked and approved by the Engineer for conformance to the drawings after removal of excess jointing aggregate.

Method of Payment: PERMEABLE CLAY PAVERS will be measured in place and the area computed in square feet.

Basis of Payment: This work will be paid for at the contract unit price per square foot as shown in the Schedule of Unit Prices for PERMEABLE CLAY PAVERS. The cost of all other materials, labor, equipment, tools and all incidental work necessary to construct the permeable concrete block pavers shall be included in the pay item for PERMEABLE CONCRETE CLAY PAVERS.

BEDDING MATERIAL (SPECIAL)

Description: This specification states the requirements for bedding and void opening aggregates for use with permeable concrete block pavers. This material is to be placed above the prepared subbase and to fill the voids between or within the block pavers.

Materials: The bedding and void opening aggregate shall be "A quality" carbonate aggregate (dolomite only) conforming to the grading requirements of IDOT CA-16.

Bedding Layer: Mechanical tampers, as approved by the Engineer, shall be used for compaction of the bedding layer placed above SUBBASE GRANULAR MATERIAL, SPECIAL around lamp standards, utility structures, building edges, curbs, tree wells and other protrusions. Areas not accessible to roller compaction equipment shall be compacted to the specified density with mechanical tampers. Care shall be taken around the perimeters of excavations, buildings, curbs, etc. Wedges of backfill shall not be placed in these areas. Backfilling and compacting in these areas shall proceed in shallow lifts, parallel to the finished surface.

Method of Measurement: BEDDING MATERIAL SPECIAL will be measured for payment in place and the volume computed in cubic yards.

Basis of Payment: This work will be paid for at the contract unit price per cubic yard as shown in the Schedule of Unit Prices for BEDDING MATERIAL SPECIAL.

BUS SHELTER REMOVE AND RELOCATE

Description. This work shall consist of furnishing and installing a reinforced concrete pad, handhole, and conduit and coordinating the relocation of the existing bus shelter Type 3, located on the west side of Sheridan Road within the project limits. The Contractor shall coordinate with the City of Chicago (CDOT) and JC Decaux (JCD). JC Decaux shall remove the shelter and reinstall the shelter.

The contacts are:

Mike Imparato – 312-747-2210 – mike.imparato@cityofchicago.org

Pablo Brezman – 312-823-7251 – Pablo.brezman@jcdecauxna.com

Materials. All materials shall conform to the latest edition of the City of Chicago Building Code and

IDOT Standard Specifications for Road and Bridge Construction, 2012 Edition (SSRBC).

1. Structural concrete shall have a minimum 28-day compressive strength of 3000 PSI, an air content of 6% \pm 1% and a slump of 4 inches maximum.
2. Reinforcing bars shall conform to ASTM A615 Grade 60.
3. Welded wire mesh shall conform to ASTM A497, fy=60000 psi, epoxy coated.
4. Steel shall be Grade A36.
5. Aggregate base rock used for structural backfill shall conform to CDOT and IDOT specifications.
6. All fill and backfill materials shall be placed per CDOT requirements.
7. Granular fill refers to crushed stone having a CA-6 gradation conforming to SSRBC.

Construction Requirements. Construction shall follow the details as outlined on Sheet 51 in the Plans.

1. All foundations shall be placed on firm undisturbed soil. IF the bottom of the foundation becomes softened due to rain or other water, pump excavation dry, overexcavate and replace soil with compacted backfill or concrete at no cost to the owner.
2. All backfilling shall conform to the applicable sections of the CDOT and IDOT SSRBC.
3. Ponding or jetting methods of backfilling are prohibited.

Inspection. The Contractor shall be responsible for required inspections and shall notify the appropriate individual or agency two (2) working days prior to the time of all required inspections. CDOT shall inspect subgrade for footings and slabs, all reinforcing steel, and final placement of concrete. Notify CDOT a minimum of two (2) working days prior to the time that the Contractor wants the inspection.

Method of Measurement. This work shall be measured as SQ YD for CONCRETE PAD, in place, FOOT for CONDUIT, and EACH for HANDHOLE, and include all work and materials incidental to the proper installation of these items. The removal and reinstallation of the bus shelter shall be measured as EACH for BUS SHELTER REMOVE AND RELOCATE.

Basis of Payment. This work shall be paid for per SQ YD for CONCRETE PAD, in place, FOOT for CONDUIT, and EACH for HANDHOLE, and include all work and materials incidental to the proper installation of these items. The removal and reinstallation of the bus shelter shall be paid for as EACH for BUS SHELTER REMOVE AND RELOCATE.

TREE GRATE

Description. This work shall consist of furnishing and installing cast iron tree grates and frames at the locations of proposed trees as shown on the plans. The frame shall be Neenah R-8713 or approved equal. Tree grates should be installed with corresponding tree grate frames as well as tree break out rings to accommodate future growth.

Method of Measurement. This work shall be measured per EACH for TREE GRATE.

Basis of Payment. This work shall be paid for at the contract unit price per EACH for TREE GRATE, which shall include all equipment, labor and materials necessary to complete the work specified herein.

STORM SEWERS AND SEWER CONNECTIONS TO CITY OF CHICAGO SEWERS

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 Perforated 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 PERFORATED EXTRA STRENGTH VITRIFIED CLAY PIPE, 8" OR EXTRA STRENGTH VITRIFIED CLAY PIPE, 12" in accordance with Articles 550.09 and 550.10 of the Standard Specifications, and the CDOT Department of Water management Standard Specifications for Water and Sewer Main Construction. The connection to the sewer will be measured and paid for at the contract unit price per each for CONNECTION TO EXISTING SEWER.

FENCE REMOVAL

Description. This work shall consist of complete removal and proper disposal of existing fencing where shown on the plans or as directed by the Engineer. The removal shall include post foundations, fittings, gates, posts and accessories. All holes left by the removal of the fence posts and post foundations shall be filled with excavated earth material.

Method of Measurement. This work shall be measured per FOOT measured along the top of the fence.

Basis of Payment. This work shall be paid for at the contract unit price per FOOT for FENCE REMOVAL, which shall include all equipment, labor and materials necessary to complete the work specified herein.

IRRIGATION SYSTEM, SPECIAL

Description:

- A. This work includes design and installation of the irrigation system as indicated on the drawings and as specified herein.
- B. Contractor shall prepare design drawings and shop drawings for approval by the Commissioner and the Department of Water Management prior to commencement of any work on this item.
- C. This work shall include all labor, material, equipment, permits, and services to construct the irrigation system as designed in approved shop drawings, in accordance with sections 561, 562, 563, and 565 of the Standard Specification for Road and Bridge Construction.

and the Standard Construction Details, except as herein modified.

Water Services:

- A. Work described in the items WATER TAP, WATER VALVE ASSEMBLY, WATER METER IN VAULT, BACKFLOW PREVENTER (R.P.Z.), and WATER SERVICE LINE will collectively be described as Water Service Components within this specification.
- B. Water Service Components must be installed prior to the installation of the irrigation system, unless otherwise approved by the Commissioner.
- C. The Water Service Components to be provided in this contract are shown in the plans. The number of water services and sizes shown in the plans have been designed to provide an adequate amount of water supply to service the areas to be irrigated (based on City of Chicago average water main pressure). If it is determined the Irrigation System requires a greater water supply to conform with the requirements of this specification the Contractor must notify the Commissioner immediately.
- D. The locations of Water Service Components are shown on the plans schematically. The location of the the Water Service Components will be determined by the Commissioner in the field. The irrigation system must be designed to accommodate the location of the Water Service Components as installed.

Electrical Services:

- A. The items contained in this contract used to supply electrical power for the irrigation system will be collectively described as the Electrical Service within this specification.
- B. Electrical Services are not required for battery or solar powered irrigation system controllers. The types of controllers to be used are shown on the plans.
- C. This specification includes requirements for both battery and electrical powered components. Therefore, some items are dependent on the type of system to be installed.
- D. Electrical Services will be obtained from either a new service from a Commonwealth Edison power source, or from a street lighting controller.
- E. Electrical services for pump stations must be obtained from a Commonwealth Edison power source.
- F. Electrical Service will extend to the pump station or irrigation system controller, and paid for using appropriate items. All electrical components from the pump station or irrigation system controller required to operate the irrigation system in accordance with this specification are considered incidental to this item and must be shown on the shop drawings.
- G. Contractor shall label all wire and circuit breakers to indicate they belong to the irrigation system, as directed by the Engineer.

Codes and Standards:

- A. Codes: All plumbing work shall be installed within applicable provisions of the City of Chicago building codes.
- B. All devices and their installation must be in accordance with the City of Chicago Plumbing Code.
- C. Standards: Items listed to conform to ASTM, ANSI, or manufactures recommendations, for installation.

Design:

The design will be completed, reviewed, and signed by a Licensed Professional Engineer or a Licensed Plumber. The design will follow these guidelines:

- A. Max velocity = 5 feet per second.
- B. Spray head distribution system shall be designed, unless the existing water main pressure is not sufficient. If main pressure is not sufficient a drip line system could be designed if approved by the Commissioner.
- C. Spray Heads Minimum Height: (Must be approved by Commissioner)
 - Non-Turf Areas: 12 inches expandable to 18 inches
 - Turf Areas: minimum 4 inches or sufficient height to account for grade differentials
- D. PSI variance:
 - All spray heads should operate at ± 3 psi of every spray head within a zone.
 - All zones should operate at ± 3 psi of every zone within a system.
- E. Isolation Valves:
 - Median Planters Isolate each median planter
 - Parkway Planters Isolate every 300 feet
 - Turf, Parks, & Malls Per Commissioner's Approval
- F. Head Spacing:
 - Median and Parkway Planters: 10 feet max spacing
 - Turf, Parks, Malls, and Plazas: 50% of the diameter of throw minimum.
 - Square or triangular spacing must be used. The heads should have a matched precipitation rate.
- G. Angle of Trajectory: Should be calculated so that the spray will be above the mature plant height.
- H. Precipitation:
 - Non-turf: Minimum 1 ½ Inch per week
 - Turf: Minimum 1 Inch per week
- I. Watering Run Times:
 - Spray Head: Three (3) waterings per week, eight (8) hour per watering maximum

duration.
Drip: Three (3) run times per week, twenty-four (24) hour per watering maximum duration, or as directed by the landscape contractor to maintain the plant health of new installations.

- J. Wiring size: calculations must be made to account for voltage drops and any splicing must be reflected on the shop drawings.
- K. Quick Couple Valves Spacing:
 - Median Planters: 200 feet or 1 per median
 - Parkway Planters: 200 feet or 3 per block
 - Parks, Malls and Plazas: 100 feet radius between valves, minimum 1.

Submittals:

- A. Shop drawings shall be prepared by a Licensed Professional Engineer or a Licensed Plumber with proven experience in the design of irrigation systems of the magnitude of this project.
- B. Shop drawings shall include pipe detailing, controller layout, fabrication and installation of irrigation systems. Indicate plans, elevations and dimensions, including all accessories.
- C. Submittals shall identify pressure at the main and include hydraulic calculations for circuit pressure losses.
- D. Submittals shall include wiring sizes and electrical calculations.
- E. Submittals shall include a complete package of catalog cut sheets for all equipment used in this irrigation system.

MATERIALS

Manufacturers and Minimum Requirements:

Manufacturers: All products listed herein are acceptable. However, the contractor can specify other products. These will be subject to review for approval prior to installation. Judgment of whether a product is equal to the approved will be based on the product information sheet, and the Commissioner's past experiences with products.

1. PVC or Polyethylene Piping & Fittings:

All sprinkler piping mainlines and lateral pipe shall be SDR-21, Class 200, Polyvinyl Chloride (PVC) with a minimum pressure rating of 200 PSI. Pipe shall be permanently and continuously marked with the manufacturer's name, trademark, size, type, and National Sanitation Foundation (NSF) seal of approval. Pipe shall conform with the requirements of Commercial Standard CFS-256 and ASTM D-2241. PVC pipe shall be as manufactured by Crestline Industries ("Crestline"), Spears Manufacturing Company ("Spears") or approved equal.

All PVC fittings shall be solvent weld, Schedule #40 and shall conform to ASTM D-2466. Fittings shall be manufactured from PVC Type I materials and shall meet National Sanitation Foundation (NSF) standards. PVC fittings shall be as manufactured by Spears, Duramanufacturer or approved equal. PVC fittings shall be joined with an approved PVC

primer and cement.

Polyethylene piping 1 inch thru 1 ½ inch can be used for lateral piping, (down stream of the control valve). The pipe shall be polyethylene NT80 irrigation pipe SIDR-15 PE2406 NSF-PW ASTM D 2239 PPFA manufactured by Crestline, Spears or approved equal. The pipe must be permanently continuously labeled accordingly. The insert fittings are to be constructed of PVC and shall conform to ASTM D 2609 and National Sanitation Foundation Standard #14 plastic fittings for potable water. Insert fittings shall be clamped to pipe with two (2) stainless steel crimp type clamps on each pipe end.

Plastic insert fittings for polyethylene plastic pipe are manufactured by Spears, Crestline or approved equal. Clamps shall be manufactured by Oetiker, Murray or approved equal.

2. Installation Main & Lateral Piping:

All sprinkler main lines shall be installed by open trench method using either a chain type trencher or hand excavated. Trenches shall be excavated so as to provide sufficient depth and width to permit proper handling and installation of pipe and fittings. Excavate the trench deep enough to provide a minimum of 18 inches of cover over the pipe. Ensure that the bottom of the trench is clean and smooth with all rock, loose soil and organic matter removed. Trench bottom must provide a smooth and continuous bearing surface to support the pipe.

When the cutting of pipe is required the pipes shall be cut clean and square with all burrs removed prior to solvent welding. Pipe must be free of all dust, dirt, moisture, grease, oil, or any other foreign material.

Pipe shall be joined by solvent welding method using a quality primer and cement applied according to the manufacturer's recommendation. Excess solvent shall be wiped cleaned from the pipe and fittings.

Sprinkler lateral piping may be installed by either open trench method or with an approved "vibratory plow". Where the open trench method is employed, the above specifications shall apply. In both the "open trench" method and the "vibratory plow" method, the minimum depth of cover for the lateral lines shall be 18 inches.

Where the "vibratory plow" method is used, the "mole" or "bullet" of the plow which precedes the pipe and is used to form the opening for the pipe shall not be less than 1 inch larger diameter than the outside diameter of the pipe. Starting and finishing holes shall be of sufficient size to allow for proper connection of the required fittings.

For polyethylene pipe, the insert fittings are to be clamped with stainless steel clamps. All fittings are to be double clamped securely over the barbs on fittings.

Detectable Warning Tape shall be installed over all pipes. The tape will be placed so that it is 6 inches above the top of the pipe. Polyethylene film warning tape manufactured for marking and identifying underground utilities, 4 inches wide and 5 mils thick minimum, continuously inscribed with "Irrigation" detectable by metal detector when tape is buried up to 30 inches deep.

3a. Irrigation Controllers (Electric Operated):

The irrigation controllers shall accommodate all zones plus 3 extra zones, providing for complete automatic operation of the system. Run time for the controller shall be 0-2 Hours per station and shall provide for schedules of up to 2 weeks with interval scheduling available as an alternate method. The controllers shall have a seasonal adjust features capable of increasing or decreasing station timing from 0% to 200%. The controllers shall have a non-volatile memory capable of holding program information during power outages.

The controllers shall have a 365-day calendar, which automatically adjusts for leap year.

The controllers shall be programmable for up to 32 start times per day per program and shall be capable of operating 24 Volt AC electric remote control valves via a 30 Volt AC transformer.

The controller cabinets shall be constructed of cold forged stainless steel, and have a key-lockable door for vandal resistance.

The controllers shall be UL listed.

The controllers shall be Rain Bird model ESP-MC, Hunter or approved equal.

3b. Battery Operated:

1. If electrical power sources are not available, a battery controller shall be substituted for the electrical controller at no additional cost to the project.
2. The controller shall be a 6 v, DC powered, have 3 independent programs that offer concurrent operation capability, have a large easy to read LCD display, have a nonvolatile memory that retains all program data, a 365- day calendar, and be able to skip up to 50 days.

The battery operated controller shall be as manufactured by Rain Bird, Hunter or approved equal. If more than 12 stations are required, additional controllers shall be supplied at no additional cost to this pay item so that the entire irrigation system can be operated and regulated. If latching solenoids are needed to convert valves from ac to dc, their cost and any other costs incurred for having a battery operated controller for the irrigation controller for the irrigation system are included under this pay item.

4. Install Irrigation Controller (Electric Operated):

The irrigation controller is to be installed in a cabinet. The cabinet shall be brown in mulched areas and green in turfed areas or as directed by the Commissioner. The cabinet shall have a single duplex outlet securely fastened. The cabinet will be able to be locked with a single lock. The lock will be provided by the commissioner. The cabinet will have the dimensions and installed per the details in the plans.

Weatherproof break-away in-line fuses shall be installed in the electrical service cable prior to the connection to the controller. The fuses shall be in the controller cabinet.

The low voltage irrigation control wiring is to be installed in 2 inch steel heavy wall

electrical conduit for protection. The conduit shall run from the controller, down and out 12 inches into the soil area. Conduit fittings are to be used to make 90 degree turn backs on the conduit at points of exit from the walls. (In no case shall the low voltage irrigation control wiring be installed in Class 160 or 200 PVC sprinkler pipe and Schedule 40 PVC 90-degree elbows).

The locations of all zones and recommended run times shall also be labeled on the controller along with the name, address, and phone number of the irrigation Installer. The Contractor is responsible for obtaining any electric permits required for the low voltage wiring.

The irrigation controller shall be installed in a secured enclosure (cabinet). The enclosure shall be UL NEMA 4X Hinge Clip with provisions for a padlock and safety chain for door stops. The approximate dimensions are 20"x20"x8" with 4 legs. It shall be constructed of all stainless steel type 316 code gauge all seam weld grinded smooth. All conduits shall enter from the bottom. The enclosure shall be equipped with proper ventilation. The enclosure shall be primed and painted (brown in mulch area and green in turf area or black if determined by the Commissioner). The controller and equipment shall be mounted on a back plate. It shall include a disconnect, GFI protection, duplex outlet, and protected fuses. All equipment housed in the enclosure shall be labeled as UL assembly. The enclosure shall be securely fastened square and level to the concrete pad using all stainless steel fasteners. Contractor shall provide a universal pad lock per the direction of the Commissioner.

5a. Automatic Control Valves (Electric Operated):

Automatic Control Valve shall be female pipe inlet and female pipe outlet connection. The diaphragm shall be of rubber construction to retain flexibility and provide maximum sealing throughout its area.

The valve shall have a manual flow control, with a hand-operated, rising-type flow control stem with control wheel/handle. All parts shall be serviceable without removing valve from the line.

18 inch solenoid lead wires shall be attached to a 24 VAC, 50/60 cycle solenoid with waterproof molded coil. The valves shall be normally closed.

The automatic control valve shall be model PEB series as manufactured by Rain Bird, Hunter or approved equal.

5b. Solenoid & Control Module for Control Valves (Battery Operated)

If electric power is not readily available the irrigation system shall be operated with latching solenoids, control modules and field transmitters. The latching solenoid shall be supplied with an installed filtered adapter allowing installation of the solenoid to the appropriate solenoid valve.

The latching solenoid shall be a UNIK DC latching solenoid Rain Bird, Hunter or an approved equal.

The control module will function properly if submerged in water. The control module will

operate on one 9V alkaline battery for one full year. The control module shall be able to operate 1 to 4 stations either sequentially or independently. The control module shall have three independent programs with eight start times each, station run time capability by the minute up to twelve hours and a seven day calendar

The control module shall be IBOC as manufactured by Irritrol Mfg. Corp, Hunter or an approved equal.

6a. Installation Automatic Control Valves (Electric Operated):

The automatic control valves are to be installed at the locations indicated on the shop drawings. All PVC shall conform to the Section 1. PVC Piping and Fittings. Schedule 80 toe-nipples are to be used on the upstream and downstream sides of the valve. Wire splicing for valves to follow Section 12 of this specification, CONTROL WIRING. Valves shall be assembled so that they fit comfortably and properly in the valve boxes allowing sufficient room for service. Every effort should be made to install the valves, and valve boxes, in a location where they will not interfere with foot traffic or the maintenance of the landscape.

6b. Installation Solenoid and Control Module for Control Valves (Battery Operated)

The control module shall be mounted inside the valve box with stainless steel fasteners. It will be mounted for ease of accessibility and connection to irrigation controller.

At sometime after the completion of this project, the commissioner may deem it necessary to utilize a power source. Wiring as for the model PEB series as manufactured by Rain Bird, Hunter or approved equal is required. The wiring should terminate at the location of the RPZ.

7. Heads; Rotary, Spray, Swing Joints:

a. Median and Parkway Planters: The Sprinkler Heads shall be fixed spray type designed for in-ground installation. The body of the sprinkler shall be constructed of non-corrosive heavy -duty cycolac. The sprinkler heads shall have a riser screen filter to prevent entry of foreign materials to the nozzle. All parts shall be removable through the top of the sprinkler case. The sprinkler heads shall have a stainless steel retraction spring to ensure positive pop-down and shall have a conilip seal and cap to provide proper sealing.

The sprinkler heads shall be of pop-up design with an overall body height of 16 inches, and have a pop-up stroke of 12 inches.

The Spray Heads shall be Model 1812 for landscaped areas as manufactured by the Rainbird, Hunter or approved equal, for turf areas Model 1804 is permitted provided that available pressure does not allow for the use of rotary heads.

b. Turf Areas (when approved by the Commissioner): Full and Part Circle Rotary Sprinkler Heads shall be gear drive rotary sprinkler heads with a built in check valve to eliminate low head drainage. Radius reduction shall be adjustable by up to 25% by means of radius adjustment screw accessible from the top of the cap. Water distribution shall be via two (2) nozzles mounted in a stainless nozzle turret.

The dual nozzles shall elevate 2-3/8 inches when in operation.

Retraction shall be achieved by a heavy-duty stainless steel retraction spring. The sprinkler head shall have a riser seal and a wiper which permits limited flushing on the up and down stroke. Rotation shall be accomplished by a planetary gear assembly. The sprinkler head housing shall be of high impact molded plastic with a 1 inch NPT connection.

The rotary heads shall be I-25 ADS series with stainless steel sleeve, manufacturing by Hunter, Rain Bird or approved equal.

- c. All heads will be installed with swing joints. Sprinkler head swing joints are to be factory assembled PVC swing joints constructed of 315-psi pressure rated materials. Swing joints shall be three-elbow construction with pre-lubricated buttress threaded connections and double O-Ring seals.

Sprinkler head swing joints shall be manufactured by Spears, Crestline or approved equal.

8. Installation Heads; Rotary, Spray, Swing Joints:

Sprinkler heads shall be installed flush and level with existing grades. Where sprinkler heads are installed along curbs or sidewalks, heads are to be placed 4 inches from the curb or sidewalk to allow for mechanized trimming. Where sprinkler heads are installed in plant beds, the sprinkler heads must be installed 2 inches from the edge of planter wall. Soil around sprinkler head shall be tightly compacted.

All lines are to be flushed clean of debris prior to the installation of sprinkler head. Sprinkler heads and spray arcs are to be adjusted so that spray does not encroach into roadways or wet buildings and other structures.

9. Quick Couple Valves:

Quick Couple Valves shall be 1 inch with one-piece body construction from heavy cast bronze.

Quick Couple Valves shall be model QCV100N manufactured by Storm irrigation Products, Rain Bird or approved equal.

Two quick Coupler Keys shall be provided. The keys shall be one (1) inch single lug coupler made from heavy cast bronze.

Quick Couple Keys shall be model C-100 with hose swivel model HS100 manufactured by Storm irrigation Products, Rain Bird or approved equal.

10. Installation of Quick Couple Valves:

Quick coupler valves are to be installed plumb in a 10 inch round valve box (see Valve Box for product) The quick coupler valves are to be secured with a 36 inch x 5/8 inch epoxy coated steel rebar driven into stable ground. The quick coupler valve and rebar are to be secured together with three separate heavy duty stainless hose clamps. All quick coupler

valves shall be mounted on a prefabricated triple swing joint assembly.

The swing joint assembly shall be model 5806-01-012 manufactured by Spears, Crestline or approved equal

11. Control Wiring:

The irrigation control wire shall be a minimum of 14 gauge, single conductor, low energy circuit cable. A single 12-gauge single conductor white control wire shall be utilized as the common wire and connected in series to each valve. Zone wire shall be red, yellow, or orange in color. Irrigation Control Wire shall be a 14 gauge minimum PVC jacketed, single conductor, 600 volt rated, low energy direct burial circuit cable. The irrigation control wire shall be UL listed.

Irrigation control wiring shall be manufactured by Paige Electric Company, Sierra or approved equal.

12. Installation of Control Wiring:

Every other solenoid valve should have a spare control wire running from the irrigation controller. The spare wires should be marked at both termination points. The irrigation control wires are to be bundled and taped together at five-foot intervals. An expansion loop shall be provided every 100 feet, at every 90-degree angle, and at each valve location. Where irrigation control wiring is installed by itself, the minimum depth of cover shall be 24 inches. Under no circumstance shall the control wires be pulled through the ground. If a vibratory plow is utilized to install control wire, the plow must be used with a wire or cable-laying blade, which allows for cable installation without pulling the wire through the ground.

Splicing is not permissible unless approved on the shop drawings. If splicing has been approved all splices shall be waterproof. Should splices be required other than at valve locations, those splices must be installed in a valve box and noted on the As Built Plans. Under no circumstances shall splices be buried.

Splice Kits shall be Scotch DBY Direct Bury Splice Kit as manufactured by Electric Products Division/3M, St. Paul, MN, American Granby or approved equal.

13. Valve Boxes:

Valve Access Boxes shall be constructed of a combination of polyolefin and fibrous inorganic components (Superflexon Plastic) which is chemically inert and normally unaffected by moisture, corrosion and the effects of temperature change. Valve Boxes shall have a tensile strength of 3,400 psi.

For the automatic control valves, the Valve Box Base shall be #170101 and Valve Box Lid shall be #17314 as manufactured by Ametek Plymouth Products Division, Sheboygan, Wisconsin, NDS or approved equal.

For the quick couple valves, the Valve Box shall be Model #181014 as manufactured by Ametek Plymouth Products Division, Sheboygan, Wisconsin, NDS or approved equal.

The lids and boxes will be green for turfed areas and brown for mulched areas.

14. Installation of Valve Boxes:

Each automatic control valve shall be installed in a valve box. A minimum of two valve boxes shall be stacked. The valve boxes shall be installed so that the valve is centered in the box allowing sufficient room for servicing of the valves. Clearance between the highest part of the valve and the bottom of the valve box lid shall be 2 inch minimum. The lid must not be too deep for convenient service. The valve box must not rest on the pipe. Clearance between the top of the piping and the bottom of the valve box shall be a minimum of 1 inch. Each valve box is to be installed flush and plumb to grade. As a part of the valve box installation 3 to 4 inches of ½ to 1 inch stone, free of fines should be placed so that the top of the stone is 2" below the valve.

15. Drip Lines:

The drip system shall include all necessary components for a drip system. Such as, filter for solenoid, drip tubing, check valves, air vacuum relief valve, lateral piping, line flush valve and fittings.

The drip tubing is to have a root barrier which makes it resistant to root intrusion.

The drip tubing is to be Netafim Techline pipe with a dripper flow rate of 0.9 GPH part # TLDL 9-1210, Rain Bird or approved equal with 12 inch on center spacing for the drippers.

16 Drip Lines Installation:

The drip tubing will be installed in rows 12 to 16 inches apart. The rows closest to the walls of the landscaped planter shall be 2 to 4 inches from the edge of the walls. The drip tubing shall be laid on the finished grade of the soil mixture. The drip tubing must be secured a minimum of every 3 feet with Techline Staples (TLS6), Gundog Supply or approved equal. The drip tubing must be installed parallel to the longest wall of the landscaped planter. If the drip tubing needs to go around a plant or obstacle, the tubing must return to its original line as soon as possible. The installation must be complete prior to mulch installation.

When possible the system shall use a center feed layout. The drip tubing shall feed from a PVC or Polyethylene supply header in a grid layout. The exhaust header and the supply header shall form a continuous loop with PVC or Polyethylene piping. The maximum distance between each supply header and exhaust header is 70 feet. The furthest distance in each direction of the solenoid valve shall contain a Netafim Line Flushing Valve, model TLFV-1, Rain Bird or approved equal. The flush valve will be below grade in a valve box with a sump. A filter shall be installed downstream of the solenoid valve with the appropriate filter mesh in accordance with Techline design manual or Rainbird, or approved equal. An air vacuum relief valve is to be installed at the highest points of each zone. The air vacuum relief valve is to be installed in a valve box. A single micro-spray head is required for each zone. The spray head is required to indicate that a zone is on and working. It should not be used as a main watering source for an area.

In situations where the slope is greater than or equal to 4% install the drip tubing

perpendicular to the slope. Check valves must be installed to prevent water from draining to the lower elevations.

Hydrostatic Testing:

- A. The test shall consist of pressurizing the mainline piping system to a minimum of 150 psi for a period of four (4) hours.
- B. During the test, the piping system shall maintain 150 psi with an allowable pressure drop of not more than 5 psi, if any deficiencies in the piping system are found, the piping or fittings shall be repaired or replaced at no additional cost to the contract.

Pressure & Flow Testing:

- A. A test will be taken of the static pressure on the upstream and downstream sides of the RPZ valve.
- B. A pressure reading shall be taken at each zone while each zone is running.
- C. The flow rate shall be recorded from the water meter at each running zone for a 5-minute period.
- D. This information shall be recorded on the As-Built drawings.

As Built Drawings:

Upon completion of the installation the Contractor shall prepare and submit an "As-Built" drawing of the completed project. The drawings will show the accurate locations of all valves, quick couplers, mainline, wire splices, backflow devices, and controllers. The drawing shall also show the approximate location of sprinkler heads and lateral lines. Each controller shall be labeled on the plan alphabetically starting with A and the zones controlled by that controller shall be labeled A-1, A-2, A-3...etc.

The drawings must also show the locations of Water Service Components and Electrical Service Components.

Demonstration:

Demonstrate to Commissioner's maintenance personnel operation of equipment, sprinklers, specialties, and accessories. Review operating and maintenance information. Provide 7 days notice to all parties in advance of each demonstration.

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

Method of Measurement: Irrigation system shall be measured per square yard of planted area.

Basis of Payment: IRRIGATION SYSTEM, SPECIAL will be paid for at the contract unit price per square yard of planted area. Which price shall be payment in full for all labor, material, equipment, and services necessary for providing the landscape irrigation systems in a serviceable, fully operational manner, including, but not limited to, excavation, backfilling, sprinkler heads, solenoid control valves, isolation valves, valve boxes, automatic controls, system testing, owner personnel training, piping, equipment identification, plumbing permits, inspection fees, valve tags, charts, supports, sleeves, fittings, valves, and accessories.

BENCHES

Description: This work shall consist of furnishing and installing a precast concrete bench at the locations shown on the plans. The bench shall be as shown on the detail in the plans, grey in color, and shall be constructed of reinforced concrete with minimum ¼ inch rebar. Bench shall be as manufactured by Wausau Tile or approved equal. Benches shall be anchored as required by the bench manufacturer. The Contractor shall submit bench manufacturer's dimensioned drawings and color samples to the Engineer for approval prior to procuring the benches.

Method of Measurement: This work shall be measured per EACH for BENCHES.

Basis of Payment: This work shall be paid for at the contract unit price per EACH for BENCHES, which shall include all equipment, labor and materials necessary to complete the work specified herein.

PLANTER

Description: This work consists of constructing sidewalk planters on Sheridan Road. The planters shall be constructed to the dimensions shown on the detail on the plans. All reinforcement, concrete, footings, fencing and subbase-material will be included in the cost of the planter.

Measurement: This work shall be measured per EACH for PLANTER.

Basis of Payment: This work shall be paid for at the contract unit price per EACH for PLANTER, which shall include all equipment, labor, and materials necessary to complete the work specified herein.

ORNAMENTAL PLANTER

Description: This work shall consist of furnishing and installing rectangular and circular precast concrete/stone planters at the locations shown on the plans. The planters shall conform to the details and dimensions shown on the plans. All planters shall have a minimum of 5 weep holes provided by the manufacturer. Drilling of weep holes by the Contractor is not allowed.

The planters shall be precast reinforced concrete utilizing Portland Cement conforming to ASTM C-150 Types I, II or III. The color shall be integral, of pure mineral oxide, limeproof and nonfading. Color to be selected by Engineer. Aggregates for the concrete shall conform to ASTM C-33 with a maximum size of 3/4 -inch. Reinforcing steel shall conform to ASTM 615 and deformations shall conform to ASTM M-305. Concrete shall provide a minimum strength of 5,000 psi at age 28 days, as determined by tests of 6-inch and 12-inch cylinders. Absorption shall not exceed 5 percent.

Planter shall be Mediterranean style as manufactured by Dura Art Stone, or approved equal. The Contractor shall submit manufacturer's dimensioned drawings, specifications, color samples and evidence of material specification compliance to the Engineer for approval prior to procuring the planters.

Method of Measurement. This work shall be measured on a LUMP SUM basis for furnishing and installing all of the rectangular and circular planters depicted on the plans.

Basis of Payment. This work shall be paid for on a lump sum basis for ORNAMENTAL PLANTER, which shall include all equipment, labor and materials necessary to complete the work specified herein.

PERENNIAL PLANTS, PRAIRIE TYPE, GALLON POT

This item of work shall follow Section 254 of the Standard Specifications except as modified herein:

Method of Measurement. This work shall be measured per UNIT for PERENNIAL PLANTS, PRAIRIE TYPE, GALLON POT. Each unit shall be 130 plants.

VEGETATIVE SCREEN PANEL

Description. This work shall consist of furnishing and installing a "green" screen at the location shown on the plans. The screen shall be as shown on the detail in the plans. The Contractor shall submit manufacturer's dimensioned drawings to the Engineer for approval prior to constructing the vegetative screen panel. The vegetative panel screen shall be manufactured by or approved equal:

Greenscreen
1743 South La Cienega Blvd.
Los Angeles, CA, 90035.
Telephone number – 310-837-0526
www.greenscreen.com

Method of Measurement. This work shall be measured per SQ FT for VEGETATIVE SCREEN PANEL.

Basis of Payment. This work shall be paid for at the contract unit price per SQ FT for VEGETATIVE SCREEN PANEL, which shall include all equipment, labor and materials necessary to complete the work specified herein.

PRECAST MODULAR RETAINING WALL

Description. This work shall consist of furnishing and installing a retaining wall at the location shown on the plans. The wall shall be as shown on the detail in the plans. The Contractor shall submit manufacturer's dimensioned drawings to the Engineer for approval prior to constructing the precast modular retaining wall. The precast modular retaining wall blocks shall be manufactured by or approved equal:

Siena Stone by Unilock
Coping Stone – 7.25" x 20" x 39"
Color – Natural – 141.5FF

As recommended by the manufacturer, an outdoor construction adhesive shall be used.

Method of Measurement. This work shall be measured per SQ FT for PRECAST MODULAR RETAINING WALL. This work shall also include the preparation, including all labor and materials, of the base for the wall.

Basis of Payment. This work shall be paid for at the contract unit price per SQ FT for PRECAST MODULAR RETAINING WALL, which shall include all equipment, labor and materials necessary to complete the work specified herein.

STAMPED ASPHALT

Description. This work shall consist of furnishing and installing a stamped HMA surface at the locations shown on the plans. The work shall follow the manufacturer's specifications included in this specification.

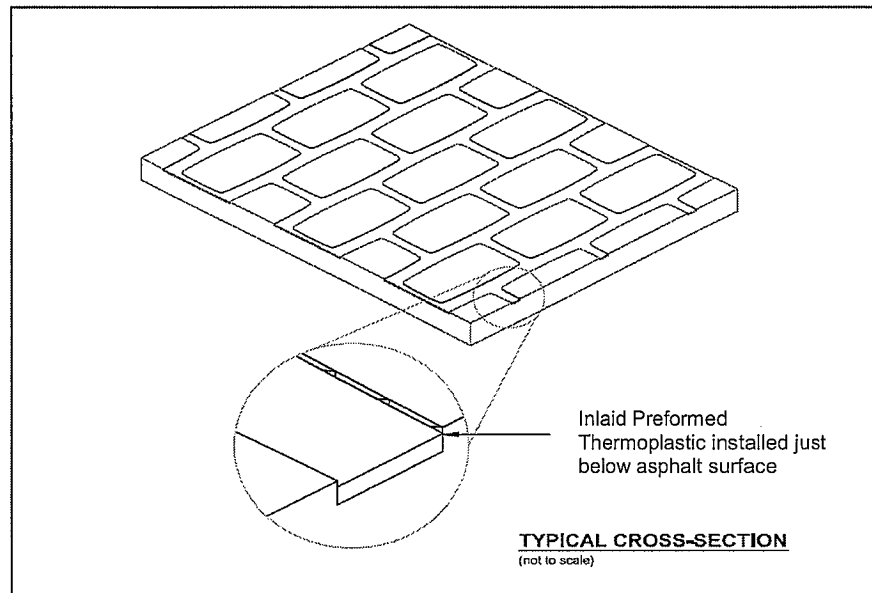
Method of Measurement. This work shall be measured per SQ YD for STAMPED ASPHALT.

Basis of Payment. This work shall be paid for at the contract unit price per SQ YD for STAMPED ASPHALT, which shall include all equipment, labor and materials necessary to complete the work specified herein.

SPECIFICATION

Inlaid Preformed Thermoplastic Asphalt Pavement Marking System

1. **Use:** A durable preformed thermoplastic asphalt pavement marking system, inlaid just below the asphalt pavement surface to create colorized patterns within the asphalt for streetscape and traffic calming purposes on public roads and private property. The inlaid preformed thermoplastic asphalt pavement marking system is typically used on public roadway crosswalks between white crosswalk lines and on residential and commercial areas open to pedestrian and vehicular traffic.
 - 1.1. The preformed thermoplastic is inlaid into asphalt pavement using proprietary infrared heating equipment designed specifically to elevate the temperature of the asphalt without it being adversely affected. A specialized template is imprinted into the heated asphalt pavement to create depressions to match the desired pattern. The preformed thermoplastic, precut by the material manufacturer to match the imprinted pattern, is laid to fit within the depressions and melted in place using the proprietary infrared heater.
 - 1.2. As shown below in the typical cross-section, the top of the inlaid preformed thermoplastic lies slightly below the surface level of the surrounding asphalt pavement allowing the pavement to absorb the physical effects of the traffic:



- 1.3. When applied in accordance with the manufacturer's application guidelines by an applicator certified by the manufacturer, the inlaid preformed thermoplastic will wear at a similar rate as the surrounding asphalt pavement. Therefore, the life of the inlaid preformed thermoplastic is dependent upon using a long lasting, durable and stable asphalt pavement to prevent premature wear.
- 1.4. The inlaid preformed thermoplastic is available in a variety of standard patterns and colors. The primary pattern shall be created using precut preformed thermoplastic sheets that are 24 in. (.6 m) x 24 in. (.6 m). The precut patterned border pieces shall measure either 8 in. (.2 m) or 12 in. (.3 m) wide x 24 in. (.6 m) long. These sizes ensure the specified patterns are created with a minimal number of seams between the preformed thermoplastic sheets. The use of individual preformed thermoplastic strips inlaid into standard imprinted patterns to create the design shall not be allowed.
- 1.5. The inlaid preformed thermoplastic is manufactured without glass beads. The inlaid preformed thermoplastic material must be a resilient preformed thermoplastic product, which contains intermixed anti-skid/anti-slip elements with a minimum hardness of 6 (Mohs scale), and where the top surface contains factory applied anti-skid/anti-slip elements with a minimum hardness of 8 (Mohs scale).

SPECIFICATION

Inlaid Preformed Thermoplastic Asphalt Pavement Marking System

2. **MANUFACTURING CONTROL AND ISO CERTIFICATION:** The manufacturer must be ISO 9001:2008 certified for design, development and manufacturing of preformed thermoplastic, and provide proof of current certification.
3. **PREFORMED THERMOPLASTIC MATERIAL:** Must be composed of an ester-modified rosin impervious to degradation by motor fuels, lubricants, etc. in conjunction with aggregates, pigments, binders, and anti-skid/anti-slip elements. Pigments and anti-skid/anti-slip elements must be uniformly distributed throughout the material. The thermoplastic material conforms to AASHTO designation M249, with the exception of the relevant differences due to the material being supplied in a preformed state, being non-reflective, and potentially being of a color different from white or yellow.

3.1. Pigments:

3.1.1. White: The material shall be manufactured with sufficient titanium dioxide pigment to meet FHWA Docket No. FHWA-99-6190 Table 5 and Table 6 as revised and corrected.

3.1.2. Other Colors: The pigment system must not contain heavy metals, nor any carcinogen as defined in 29 CFR 1910.1200 in amounts exceeding permissible limits as specified in relevant Federal Regulations.

3.2. Skid Resistance: The surface of the preformed thermoplastic material shall contain factory applied anti-skid material with a minimum hardness of 8 (Mohs scale). Upon application the material shall provide a minimum skid resistance value of 60 BPN when tested according to ASTM E 303.

3.3. Slip Resistance: The surface of the preformed thermoplastic material shall contain factory applied anti-skid material with a minimum hardness of 8 (Mohs scale). Upon application the material shall provide a minimum static friction of coefficient of 0.6 when tested according to ASTM C 1028 (wet and dry), and a minimum static coefficient of friction of 0.6 when tested according to ASTM D 2047.

3.4. Thickness: The material must be supplied at a minimum thickness of 90 mil (2.3 mm).

3.5. Environmental Resistance: The material must be resistant to deterioration due to exposure to sunlight, water, salt or adverse weather conditions and impervious to oil and gasoline.

3.6. Storage Life: The material may be stored for 12 months, if stored indoors and protected from the elements.

3.7. Transverse Lines for Inlaid Preformed Thermoplastic Crosswalk Application: Supplied as white, retroreflective preformed thermoplastic linear striping material in 90 mil (2.3 mm) or 125 mil (3.2 mm) thickness, material is available in 6 in. (.15 m), 8 in. (.20 m) or 12 in. (.30 m) widths. This material may be supplied and applied by the certified applicator in conjunction with the inlaid preformed thermoplastic system and is available from the inlaid preformed thermoplastic manufacturer. (Consult the manufacturer's published application instructions for the preformed thermoplastic linear striping material selected for proper application methods.)

4. **SPECIALIZED APPLICATION EQUIPMENT:**

4.1. Stamping Templates: Designed and constructed for imprinting the specified pattern into the asphalt pavement, templates are supplied by the inlaid preformed thermoplastic manufacturer in 150 mil (3.81 mm) thickness. Standard patterned templates are designed to create crosswalks ranging from 6 ft. (1.8 m) to 20 ft. (6.1 m) wide, in 2 ft. (.6 m) width increments. Template layout drawings shall be supplied by the inlaid preformed thermoplastic manufacturer to illustrate proper template placement to create the specified pattern. Certain templates may be field assembled as needed using the manufacturer supplied template assembly kit. For crosswalk widths less than 6 ft. (1.8 m) or more than 20 ft. (6.1 m), custom templates may be designed and constructed in 2 ft. (.6 m) width increments.

SPECIFICATION

Inlaid Preformed Thermoplastic Asphalt Pavement Marking System

- 4.2. Heating Equipment: The inlaid preformed thermoplastic manufacturer shall distribute reciprocating infrared heating equipment designed specifically to elevate the temperature of the asphalt pavement without adversely affecting it, as well as the inlaid preformed thermoplastic material. The primary asphalt heating unit must employ a bank of propane-fired infrared heaters, mounted on a track device that allows the heater bank to reciprocate back and forth over a designated area, thereby allowing the operator to monitor the temperature of the asphalt pavement and the inlaid preformed thermoplastic at all times during the pavement heating process.
- 4.2.1. A smaller, mobile infrared heater distributed by the inlaid preformed thermoplastic manufacturer is designed specifically to heat areas such as borders and narrow areas that are inaccessible to the primary heater. This secondary heater also allows the operator to monitor the temperature of the asphalt pavement and the inlaid preformed thermoplastic at all times during the heating process.
- 4.2.2. An approved hand-held propane heat torch distributed by the inlaid preformed thermoplastic manufacturer shall be used to heat isolated areas of the asphalt pavement or inlaid preformed thermoplastic.
- 4.3. Hand Held Finishing Tool: Enables the applicator to complete the imprinting of the asphalt pavement in areas around permanent structures, such as curbs and manholes covers, which may be inaccessible to the stamping template. The hand held finishing tools are distributed by the inlaid preformed thermoplastic manufacturer.
- 4.4. Vibratory Plate Compactor (700-900 lb. / 318-408 kg): Shall be used for pressing the stamping template into the heated asphalt to create the specified pattern. The inlaid preformed thermoplastic manufacturer does not supply vibratory plate compactors.

5. APPLICATION (Asphalt Substrate Only):

- 5.1. Manufacturer Certified Applicator Requirement: The material shall be supplied and applied only by an applicator certified by the manufacturer. The applicator shall provide proof of current certification before commencing work. The Certified Applicator shall follow the manufacturer's current published application guidelines.
- 5.2. Substrate Condition: The material must only be applied to a stable, high quality asphalt pavement substrate over a stable base, that is free of defects, as per the manufacturer published substrate guide. The asphalt pavement surface shall be dry and free from all foreign matter, including but not limited to dirt, dust, de-icing materials, and chemical residue.
- 5.3. Procedure: The asphalt pavement surface is heated with the primary reciprocating infrared heater to the appropriate temperature range to allow for surface imprinting. The stamping template in the specified pattern is imprinted into the heated asphalt pavement using the 700-900 lb. vibratory plate compactor. The preformed thermoplastic sheets, precut at the factory by the material manufacturer to match the template pattern, are laid into the pattern created by the stamping template, and heated until thoroughly molten with the primary reciprocating infrared heater. The mobile infrared heater or approved propane heat torch may be used in areas inaccessible to the primary reciprocating infrared heater. The material is then allowed to cool thoroughly before being opened to vehicle or pedestrian traffic. (Consult the manufacturer's published application procedures for complete information.)
- 5.4. The inlaid preformed thermoplastic asphalt pavement marking system shall not be applied to Portland Cement Concrete.

5. PACKAGING: The preformed thermoplastic material shall be vacuum sealed in protective plastic film with cardboard stiffeners to prevent damage in transit. The cartons in which standard preformed thermoplastic patterned sheets are packed shall be non-returnable and shall not exceed 25 in. in length and 25 in. in width. The cartons shall be labeled for ease of identification. The weight of an individual carton must not exceed fifty (50) pounds. The carton must be wrapped with a protective film to protect the material from rain or premature aging.

6. TECHNICAL SERVICES: The successful bidder shall provide technical services as required.

CDOT ADA SPECIFICATIONS

DETECTABLE WARNINGS

Description. This work consists of providing all labor, materials, tools, and equipment necessary to install a TACTILE / DETECTABLE WARNING SURFACE of the specified type having a surface color and a truncated dome pattern.

Materials. TACTILE / DETECTABLE WARNING SURFACE must be on the list of approved COOT manufacturers. See CDOT's web page for the list of approved manufacturers.

General Requirements. This work consists of furnishing and installing Tactile/Detectable Warning Surface System on Curb ramps. This work will be done in coordination with the items PORTLAND CEMENT CONCRETE SIDEWALK 5 INCH, where shown on the drawings or as directed by the Engineer. Tactile/ Detectable Warning Surface Systems must be installed per the latest COOT ADA Standard details.

Construction Requirements.

- A. Installation shall be per the manufacturers recommendations.
- B. PRIOR TO PLACEMENT OF THE TACTILE/ DETECTABLE WARNING SURFACE SYSTEM, THE LAYOUT IS TO BE REVIEWED AND APPROVED BY THE RESIDENT ENGINEER.
- C. The concrete pouring and finishing operations require typical mason's tools, however, a 2' long level with electronic slope readout (SMART LEVEL), 25 lb. weights, vibrator and small sledge hammer with 2" x 6" x 20" wood tamping plate are specific to the installation of the TACTILE/ DETECTABLE WARNING SURFACE SYSTEM.
- D. The concrete must be poured and finished, true and smooth to the required dimensions and slope prior to tile placement. Immediately after finishing the concrete, the electronic level should be used to check that the required slope is achieved. The tile must be placed true and square to the ramp in accordance with plan drawings and the CDOT ADA Standards. The TACTILE/ DETECTABLE WARNING SURFACE SYSTEM must be tamped or vibrated into the fresh concrete to ensure that the field level of tile is flush to the adjacent concrete surface. The tile field level (base of truncated dome) is flush to adjacent surfaces to permit proper water drainage and eliminate tripping hazards between adjacent finishes. The tolerance for elevation differences between tile and adjacent surface is 1/16". Place the second panel next to the first, leaving no gap (tiles must be abutted to one another) and press into the wet concrete using a twisting back and forth motion. Be certain that the second panel is even and level with the first and with the surrounding concrete.
- E. Immediately after tile placement, the tile elevation is to be checked to adjacent concrete. The tile elevation and slope should be set to permit water drainage to curb as the design dictates. While concrete is workable a steel trowel must be used to trowel the concrete around the tile perimeter to the field level of the tile. Trowel concrete flat; remove any excess concrete and leaving no gap (tiles must be abutted to one another) between the panels. Apply broom finish or other recommended finish to the area immediately surrounding the panels.
- F. During and after the tile installation and the concrete curing stage, it is imperative that there is

no walking, leaning or external force placed on the tile to rock the tile, causing a void between the underside of tile and concrete.

- G. Following the curing of the concrete, the protective plastic wrap is to be removed from the tile face by cutting the plastic with a sharp knife tight to the concrete/tile interface.
- H. Protect the tactile detectable warning surface system against damage during the construction period to comply with tactile tile manufacturer's specification. Materials damaged prior to placement or during construction will be replaced at the Contractor's cost.
- I. Deliver tactile detectable warning surface system materials to the worksite in such quantities and at such times as to assure continuity of installation. Handle and transport material in a position consistent with their shape and design in order to avoid excessive stresses or damage.
- J. Store material to prevent cracking, distorting, warping, staining or other physical damage.
- K. Keep material under cover and protected until installed.
- L. Deliver anchors in sufficient quantity for the work to be done before the start of construction.

QC/QA Requirements.

The contractor must provide a Manufacturer's written certification that the TACTILE / DETECTABLE WARNING SURFACE provided is the same product approved by CDOT and IDOT on the list of approved manufacturers.

The detectable warning system shall come with a Manufacturer's five year warranty. The warranty period will begin upon final acceptance of the project.

Method of Measurement. TACTILE / DETECTABLE WARNING SURFACE will be measured in square feet of installed area.

Basis of Payment. The work under this item will be paid for at the contract unit price per square foot for a TACTILE / DETECTABLE WARNING SURFACE which price will include all labor, tools, equipment, materials and incidental work necessary to complete the work as specified herein.

CDOT LANDSCAPING SPECIFICATIONS

TREE, GLEDITSIA TRIACANTHOS INERMIS (SUNBURST HONEY LOCUST), 4" CALIPER, BALLED AND BURLAPPED

TREE, AMELANCHIER X GRANDIFLORA (APPLE SERVICEBERRY), 12 HEIGHT, SHRUB FORM, BALLED AND BURLAPPED

SHRUB, HYDRANGEA PANICULATA (LIME GREEN PANICLE HYDRANGEA), 3.5' CONTAINER

SHRUB, SALIX PURPUREA NANA (DWARF BLUE LEAF ARCTIC WILLOW), 24" HEIGHT, CONTAINER

EVERGREEN, JUNIPERUS CHINENSIS VAR. SARGENTII (GREEN SARGENT JUNIPER), 2.5' WIDTH, CONTAINER

EVERGREEN, THUJA OCCIDENTALIS SMARAGD (EMERALD GREEN AMERICAN ABROVITAE), 9' HEIGHT, BALLED AND BURLAPPED

EVERGREEN, PINUS MUGO VAR. PUMILIO (MUGHO PINE), 4.5' HEIGHT, CONTAINER

GROUND COVER – EUONYMUS FORTUNEI VAR. 'COLORATUS' (PURPLE LEAF WINTERCREEPER), 2.5 INCH POT

VINE-CAMPSIS RADICAN CULTIVAR (FLAVA TRUMPET VINE), 3-GALLON POT

Perform work under this item in accordance with Section 253 of the Standard Specifications; City of Chicago, Bureau of Streets, Special Provision for Tree Planting revised January 1, 1982; and the Detailed Construction Standards, except as herein modified.

Description: This work consists of excavation of planting sites, removal and disposal of spoil, root removal as required, purchase, transportation, storage, preparation and planting of balled and burlapped (B&B) trees and other container grown plants, placement of top-soil as needed, furnishing and installation of shredded hardwood bark mulch, Two (2) year plant guarantee and replacement, traffic control and protection, watering and all related work necessary to assure a healthy and well established tree.

General Requirements: The Contractor is responsible for obtaining two (2) permits from the City of Chicago. Permits for the opening of the parkway and traffic control and protection required under this contract for any type of barricade or signs to be utilized for public notice of work shall be obtained from the Department of Transportation, Bureau of Traffic, City Hall, Room 804, 121 North LaSalle Street, Chicago, IL 60602 (312) 744-4656.

Permits for actual planting work must be obtained from the Department of Streets and Sanitation, Bureau of Forestry, Plans and Permit Section, 3200 S. Kedzie Avenue, 2nd Floor, Chicago, Illinois.

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

All plants shall be obtained from reputable nurseries, in hardiness zones of comparable local climate range to the City of Chicago and approved by the Engineer. All trees shall be selected well in advance of the planting season. All material shall be dug prior to leafing out (bud break) or when the trees have gone dormant in the fall.

Plants shall meet the standards of "American Standards for Nursery Stock", ANSI Z60.1-1996, American Association of Nurserymen, which by reference is made a part of these specifications.

The Contractor shall be responsible for all costs related to the inspection of all trees at the growing site, in the ground. This includes, but is not limited to the cost of travel, lodging and related expenses. All plant inspections shall take place during normal working hours. The Contractor shall be responsible for giving timely notice to the Commissioner and making all necessary arrangements for inspection.

All trees and shrubs shall be true to name. The Contractor shall label plainly all trees with a waterproof label that shall state the botanical name and size of the respective species on each label. The labels shall be attached firmly to the trees and shall be of such nature as to be remain legible for at least sixty days.

Plants shall meet all requirements of federal, state, and local laws with respect to plant type, labeling, nursery, or plant inspection, disease, insect, and other pest infestation, and any other requirements. An inspection certificate required by law to this effect, shall accompany each shipment of trees.

Field collected plants are not acceptable.

Plants shall be covered during transport and storage. Plants shall be in a healthy, vigorous condition, free of dead or broken branches, scars that are not completely healed, frost cracks, disfiguring knots, broken or abraded bar, redundant leader or branches (no double leaders), rubbing branches, or aberrations of any kind. Multi-stemmed trees are not acceptable.

Plants shall have full, even and well-developed branching with a single primary leader.

The rootball shall be of a size comparable to the standards set forth in the latest version of "American Standards for Nursery Stock", ANSI Z60.1-1996.

All balled and burlapped (B&B) trees shall be dug with a firm rootball of natural earth, of a size in proportion to the plant's size, as measured by caliper, height and spread.

B&B trees shall be handled by the rootball only, not by the trunk or branches as this may loosen the rootball and damage the root system. Trees having broken or cracked rootballs during delivery or at any time during the planting operation shall cause the tree to be unacceptable and rejected. Contractor shall be responsible for providing a replacement tree at no additional cost to the City.

The planting shall be done between:

1. FALL: October 1 to November 30*
2. SPRING: March 15 to June 30*

* Dates dependent on tree species and weather. May begin or end up to two weeks prior or after the above dates.

In the fall, trees shall be planted when dormant, that is when the trees are exhibiting fall color change and have initiated leaf drop. In the Spring, trees shall be planted prior to or just after leaf emergence. This also varies with tree species and weather.

All topsoil for planting shall follow the specification for TOPSOIL (PLANTING MIXTURE).

Before any topsoil is delivered, the Contractor shall furnish the Engineer a statement giving the location of all properties from which the topsoil is to be obtained and the names and addresses of the Owners of the properties, and shall submit a typical sample.

Pre-emergent weed control shall be Treflan 5G or as directed by the Engineer.

Shredded bark mulch shall follow the specification for MULCH.

Tree wrapping material shall be ten (10) ounce, untreated burlap, not less than six (6) inches wide nor more than ten (10) inches wide. Submit sample to the Commissioner or Authorized Representative for approval.

Method of Construction. Construction of this item shall conform to the provisions of Section 253 of the Standard Specifications, and tree planting details except as herein modified.

- A. Site Preparation Prior to Tree Planting - The Contractor shall excavate the required planting areas, disposing of excavated material off site. The excavation for planting shall be of sufficient depth to accommodate the tree rootball and shall be a minimum of twice (two times) the diameter of the rootball or as directed by the Engineer. The sides shall slope gradually making the hole saucer shape. Removal of any existing tree roots encountered during excavation shall be considered incidental to this item.

After the tree pit is dug, proper protection shall be provided by mulching to keep the earth from freezing. Topsoil shall also be protected from freezing.

- B. Tree Planting - After the tree pit is excavated to the required depth, topsoil shall be placed in the pit to the proper depth to receive the ball of the tree and then properly compacted.

All rootballs shall be kept damp and thoroughly protected from sun and drying winds at all times during transportation, and prior the final planting.

All trees shall be planted completely before leaving the planting location. Planting holes shall not be left excavated and open beyond the accepted hours of operation.

The existing nursery line on the tree shall be at existing ground level upon completion of the planting operation. Trees planted with the nursery line below existing ground level will not be accepted. Trees planted with the nursery line more than one inch above existing ground level will not be accepted.

Upon setting the tree in the excavated planting hole, the tree shall be checked and adjusted until it is standing straight and upright from all angles and turned to the best advantage.

After the tree has been set in the planting site, all ropes and/or strings shall be cut and removed from the rootball. All burlap from the top third (1/3) of the rootball shall be removed.

Wire baskets, when used, shall be cut down to a minimum of six inches (6") below the top of the ball.

Due and reasonable care shall be exercised in the handling of trees. Trees shall not be handled, moved, bound, tied or otherwise treated so as to damage the rootball, roots, trunk or branches in any way. Trees damaged in any way, shall be rejected.

Corrective pruning shall be done after trees are in place. This includes pruning to improve form and remove dead, damaged, diseased or conflicting branches.

Topsoil shall be placed in the planting hole and around the rootball and carefully compacted to eliminate voids. When the hole is two-thirds (2/3) full, the contractor shall add water as necessary and allowed to drain: When the water has drained, the remainder of the planting hole shall be filled with dirt. Soil shall be placed at the edge of the planting hole in such a manner as to create a mound of earth approximately six (6) inches high and six (6) inches wide, encircling the planting hole. Soil shall not be placed on the top of the rootball.

Fertilize all trees with a complete commercial chemical fertilizer of approved manufacture in accordance with the manufacturer's instructions as to the rates and methods of application. Fertilizer shall be of the following composition by weight - 10% organic base nitrogen, 10% phosphoric acid, 10% potash.

A thorough watering of the tree shall occur to assure complete saturation of the backfill.

- C. Wrapping - Trees shall be wrapped during the fall planting season only. All trees wrapped during this time period shall have the tree wrap removed by April 15th of the following year. Removal of tree wrap shall be incidental to the contract. Trees shall be pruned to the specified mark prior to wrapping.

Trees shall be wrapped at time of planting, before the installation of mulch. Nursery installed trunk protection shall be removed prior to tree wrapping.

Prior to wrapping the tree trunk shall be inspected for injury to the bark or improper pruning.

Wrapping shall start at the base of the trunk, overlapping the burlap at least one-third (1/3) its width to a height above the first branch. The tree wrap shall be secured with sisal twine at the bottom and looped every eight (8) to ten (10) inches up the trunk and tied at the top.

- D. Mulching - All trees shall be mulched at time of planting after tree wrap has been installed and before leaving the site.

A mulch layer, as specified shall be applied to a depth of not less than four (4) inches and no more than six (6) inches deep. The mulch shall be in a circle covering the entire planting area. At the edge of the planting site, the mulch shall have a raised edge two (2) inches above the mulch layer. Mulch shall not be placed around base of trunk

- E. Cleanup - All material "tracked" down the pavement shall be removed each day. All sidewalks, driveways, alleys and pavements shall be in a "Broom" cleaned condition prior to leaving the planting site.
- F. Maintenance - The landscape contractor shall provide maintenance which shall include, but not be limited to: trimming, weeding, watering, and mulching. This work shall be performed during the guarantee period.
- G. Guarantee - All plants shall be guaranteed for a period of two years following the completion of all plantings and initial acceptance. All plants shall be alive and in vigorous growth at the end of the maintenance period. If any plants are found to be dead or dying, the Contractor will be informed and he shall make any necessary corrections.
- H. Replacement - Replacement required during the period of guarantee shall be plants of the same kind and size shown on the drawings, furnished and planted as originally specified. The cost of placement shall be borne by the Contractor, except for replacement resulting from unauthorized removal, loss or damage, due to vandalism or to mechanical injury on the part of others.

Method of Measurement: Trees shall be measured at a point 4 feet above the ground line.

Basis of Payment: The work shall be paid for at the contract unit price each for various varieties of plants as indicated on the plans, which price includes payment for all labor, material and equipment necessary to complete the work as described above, including all required fertilizer, weed killer, mulch, excavation and disposal of surplus material, wrapping, maintenance, watering, and all other attendant materials.

MULCH

SHREDDED HARDWOOD BARK MULCH

Mulch installation described below shall be performed at all planter locations and as directed by the Commissioner.

Description: This item shall consist of furnishing, transporting and placing MULCH in planter bed areas as described herein and per direction of the commissioner.

General Requirements: The Contractor shall supply and install MULCH, as required to mulch around trees, shrubs, and herbaceous plants in landscaped areas. Annual areas shall be mulched with pine bark fines.

The Contractor shall remove all litter and plant debris before mulching. The Contractor shall repair grade by raking and adding Planting Soil as needed, before mulching. Care shall be taken not to bury leaves, stems, or vines under mulch material.

All finished mulch areas shall be left smooth and level to maintain a uniform surface and appearance. All work areas shall be clean of debris and mulch, prior to leaving the site.

Hardwood bark mulch shall be clean, finely shredded mixed-hardwood bark, not to exceed two (2) inches in its largest dimension, free of foreign matter, sticks, stones, and clods. All hardwood mulch shall be processed through a hammermill. Hardwood bark not processed through a hammermill shall not be accepted.

A sample and request for material inspection form must be supplied to the commissioner for approval prior to performing any work.

Place mulch layer around all plants as follows:

Perennials, including: bulbs, ground cover, vines, grasses:

Two (2) inches deep - keep mulch away from crowns of plants.

Annuals:

Up to one (1) inch deep - spread lightly through annual plantings.

Shrubs, including shrubs and roses:

Three (3) inches deep mulch - keep mulch away from stem, crown, or neck of shrub.

Trees, shade and ornamental:

Three (3) inches deep - keep mulch away from the trunk of the tree.

Basis of Payment: MULCH will not be paid for but will be considered incidental to all plantings and shall include all labor, material, and equipment necessary to complete the item stated above.

TOPSOIL (PLANTING MIXTURE) PLANTER SOIL MIX

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

Description: This work shall consist of locating, stockpiling, testing, preparing, and placing planting soil including finish grading at locations shown on the plans or as directed by the Commissioner.

General Requirements: In general the planting soil shall be a mixture of (2) parts pulverized topsoil and (1) part coarse sand. The sand, in the amount required to produce an acceptable planting soil, shall be added and mixed during the pulverization process only. The sand shall be of an FA 2 gradation.

Soil Stockpiling: The Contractor shall obtain the total quantity of planting soil required for this project and stockpile this material at an acceptable offsite location a minimum of 30 days in advance of placement. The stockpile must be covered to avoid excessive moisture content and erosion. The Contractor shall have the material tested following the guidelines presented below under Soil Testing and, if approved, this stockpile shall be the sole source for planting soil to be delivered to site. The test results along with a Request for Inspection form should be sent to the Commissioner prior to delivering the material to site. This transmittal must also identify the location of the stockpile. If there are any changes in source the Contractor shall notify the Commissioner immediately. There will be no additional time allowed for the completion of this project in order to substitute, test, and approve a new source of planting soil.

Delivery, Storage and Handling: Protect soil from absorbing excess water and from erosion at all times. Do not store materials unprotected from large rainfall events. Do not allow excess water to enter site.

Soil Testing: No planting soil shall be delivered to the site until the Commissioner has reviewed test results and has accepted the planting soil. The Contractor shall employ a soil testing agency acceptable to the Commissioner, which uses test methods approved by the Association of Agricultural Chemists. Test frequency shall be as follows:

Quantity of Soil Placed (c.y.)	Number of Tests
1-200	1
200 -1000	3
1000<	$((\text{Quantity} - 1000) / 500) + 3$ round up to whole number

When more than one test is performed, the average of the test results will be used to determine acceptance.

The planting soil test report must contain the following information:

1. Chemical Analysis:

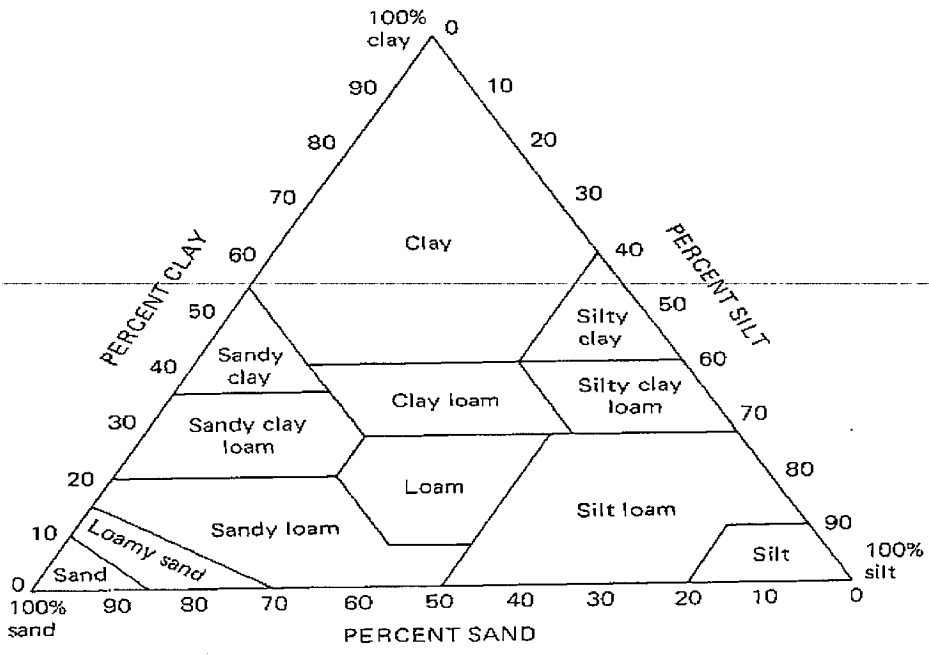
	HIGH	LOW
a. pH	7.0	6.5

2. Mechanical Analysis

a. % clay	25%	0%
b. % silt	77%	45%
c. % sand	33%	25%

3. Additionally the following variables are required.
 - a. cation exchange capacity (CEC)
 - b. soluble salts
 - c. organic matter
 - d. phosphorous
 - e. available potassium
 - f. nutrients
 - g. residual chemicals

Soil test must contain lab's recommendations for amending soil to meet the criteria above.



The mechanical analysis should show that the % sand, % silt, and the % clay must yield a silt loam soil. See the Textural Classes diagram above. To determine the class plot a line parallel to the % clay axis starting the line at the value of the % silt. Plot another line parallel to the % sand axis starting the line at the value of the % clay. The intersection of these lines must be in the silt loam region, for the soil to be approved.

Preparation and Placement:

1. Perform or coordinate final adjustments of any utility structure.
2. Clean planters of all trash and debris before placement of soil mix. Remove and legally dispose of debris off site. Repair to the satisfaction of the Commissioner any portion of the geotechnical fabric or drainage layers prior to installation of planting soil mix.
3. Place, spread and rough grade specified planting soil to depths specified in all areas to be planted. Place planting soil mix in two (2) lifts. The first lift shall contain 2/3 of the planter soil depth. After placing each lift, moisten the surface at a rate sufficient to hydraulically settle the soil, as determined by the Commissioner. Allow water to thoroughly percolate through the soil before placing the next lift. Allow for settling, and place additional planting soil as necessary. Allow for placement and mixing of organic material, as determined by the Commissioner, but place enough soil mix to meet finish grades within +/- 0.10 foot of design grades.
4. Rake smooth and finish grade all planted areas. The removal of excess material or the addition of planting soil maybe required prior to landscaping. This shall be considered incidental to planting soil. Grading will be to a tolerance +/- 0.10 foot of design grades. Any grade disturbed by irrigation installation shall be restored to finish grade and raked smooth.
5. All debris, litter, tire tracks, dirt, and unintended materials shall be removed, swept or washed off of all landscape, hard median surfaces, and pavement on a daily basis.

Planter Soil Acceptance:

The Commissioner retains the right to visually inspect planting soil mix on site before placement. The Commissioner may ask that material suspected of not meeting specification be removed from the site, until the material can be mechanically tested.

The final determination of the planter soil quality shall be based upon soil tests taken by the Commissioner. The samples shall be taken at the time of planting soil installation. The samples will be tested by independent accredited agencies, for the Commissioner. The test frequency shall be the same as listed above. When more than one test is required, the percentages of sand, silt and clay will be averaged. This averaged value will be used to determine the soil quality.

If the averaged test result for sand or silt content is outside the range specified by less than five (5%) percent, an adjusted unit price will be used in computing payment for the planting soil. The adjusted unit price will be a percentage of the contract unit price as given in the following schedule:

<u>Average Sand or Silt Deficiency</u>	<u>Percent of Contract Payment</u>
0 to 2	80
2.1 to 4	66
4.1 to 5	50

Clay content in excess of this specification by two (2%) percent or less: If the averaged result for

clay content is outside the range specified by less than two (2%) percent an adjusted unit price will be used in computing payment for the planting soil. The adjusted unit price will be sixty-six (66%) percent of the contract unit price.

The Contractor shall remove all planting soil and install material meeting this specification. The Contractor shall be responsible for all costs incurred to remove deficient material and install acceptable planting soil. The Contractor shall be responsible for any damage to plant material, irrigation system, waterproof membrane, or any other damage caused by this work. The Contractor shall be responsible for all additional traffic control. No additional time will be provided in the contract to perform remedial work.

Method of Measurement: TOPSOIL (PLANTING MIXTURE) will be measured for payment in cubic yards, in place and the volume computed by the method of average end areas. Payment will not be made based on load tickets.

Basis of Payment: TOPSOIL (PLANTING MIXTURE) will be paid for at the contract unit price per cubic yard, which price shall include all testing, furnishing, stockpiling, transporting of materials, and all labor and equipment necessary to complete the work as specified.

CDOT BOE SPECIFICATIONS

REMOVE EXISTING TRAFFIC SIGNAL EQUIPMENT

1. Description. This work will consist of removing all the existing traffic signal equipment at the intersections listed on the plans.
2. Removal. The items to be removed will include traffic signal arms, traffic signal poles, traffic signal heads, traffic signal controllers, and all associated equipment and cable.

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

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

3. Method of Measurement. This item will be measured as one unit per project contract, or per signalized intersection, depending upon the contract conditions. The breaking down of foundations and manholes will not be considered part of this item.
4. Basis of Payment. This work will be paid for at the contract ~~EACH~~ price for REMOVE EXISTING TRAFFIC SIGNAL EQUIPMENT, or ~~each~~ per intersection depending upon the contract conditions. This price will be payment in full for removing the equipment and

disposing of it as required. The salvage value of the cable retained by the Contractor must be reflected in this contract ~~Each~~ price.

**MONUMENT FOUNDATION, TYPE A
FOUNDATION REMOVAL
BREAKDOWN CONTROLLER FOUNDATION, TYPE A
BREAKDOWN STREET LIGHT FOUNDATION**

1. 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.
2. Method of Measurement. This work will be measured per square feet or each of foundation removed, which will also include proper disposal and backfill.
3. Basis of Payment. This work will be paid for at the contract unit price per square feet and each for FOUNDATION REMOVAL and MONUMENT FOUNDATION, TYPE A, respectively 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.

TRENCH AND BACKFILL WITH SCREENINGS

1. Description. This work will consist of excavating a trench for the installation of conduit and backfilling with limestone screenings as a portion of the total backfill of the trench, all as shown in Bureau of Electricity Standard Drawings No. 579 and No. 813. This work must meet all applicable requirements of Article 815 of the Standard Specifications.
2. Material. Underground Cable Marking Tape must meet the requirements of Section 1066.05 of the Standard Specifications. Backfill must meet the requirements of Section 1003.04 of the Standard Specifications.
3. Construction Requirements. The trench must be deep enough to provide thirty inches (30") of cover over the conduit to be installed. The trench must not exceed twelve inches (12") in width unless approved by the Resident Engineer. The bottom of the trench must be tamped, and the trench inspected by the Resident Engineer before conduit is installed. All trenches must be backfilled as soon as possible after the installation of the conduit or cable. Any material excavated from the trenches that in the opinion of the Resident Engineer is satisfactory backfill, may be used for backfill above the layer of screenings. The limestone screenings must be used to fill the bottom of the trench to a depth of one foot above the top of the conduit or duct encasement. Cinders, rocks, or other inappropriate materials will not be permitted to be used as backfilling material. Backfilling material, beginning with limestone screenings must be deposited in the trench in layers not to exceed six inches (6") in depth, and must be thoroughly compacted with a mechanical tamper before the next layer is deposited in the trench. All trenches for conduit must be

backfilled as per this specification. Unsuitable material must be disposed of according to the requirements of Section 202.03 of the Standard Specifications. Underground cable marking tape must be installed twelve inches (12") below the finished grade for all conduit runs.

4. Method of Measurement. This work will be measured in feet along the centerline of the trench. Trench and backfill will not be measured for payment for conduit which is installed by pushing or by directional boring. Where more than one (1) conduit is installed in a single trench, only one run will be measured for payment.
5. Basis of Payment. This work will be paid for at the contract unit price per lineal foot, measured with conduit in place, for TRENCH AND BACKFILL WITH SCREENINGS. Such price will include the cost of all excavation, furnishing and placing all backfill material, and disposal of all surplus excavated material. If sidewalk, driveway pavement or pavement must be removed and replaced, such work will be paid for separately.

CONNECTING TO EXISTING HANDHOLE VAULTS DRILL EXISTING MANHOLE OR HANDHOLE

1. Description. This work will consist of drilling a hole in an existing handhole or manhole for the installation of a new conduit. This item must meet the requirements of Article 879 of the Standard Specifications.
2. Construction. The size of the hole must be as close as possible to the size of the conduit to be installed. The conduit must be installed in the drilled hole with a bushing before the hole is grouted. The conduit will be covered by a separate item. The space between the conduit and the handhole or manhole wall must be caulked with a waterproof grout. Drawing 814 provides additional information.
3. Method of Measurement. This work will be measured per each hole drilled.
4. Basis of Payment. This work will be paid for at the contract unit price each for CONNECTING TO EXISTING HANDHOLE VAULTS, which price will be payment in full for drilling the hole, grouting, and any additional work required to accomplish this task.

CLEAN EXISTING MANHOLE OR HAND HOLE

1. Description. This item will consist of furnishing all labor, materials, tools and equipment necessary to clean a manhole or handhole. Work must include the removal and disposal of all foreign debris and liquids from the manhole or handhole. Manholes or handholes to be cleaned will be identified on the plans or by the Resident Engineer.
2. Cleaning. The inside dimension of the hand hole will normally be 30 to 36 inches in diameter and three feet in depth. The inside dimension of the manhole will normally be 3'x4'x4' or 4'x6'x6'. Handholes and manholes of other dimensions may be encountered. Cleaning will include opening the lid and placing the lid back in place after cleaning. The cables must not be damaged or disturbed during the cleaning process. All debris removed from the hole must be properly disposed of in an approved manner and not be left in the public way or dumped into the City sewer system. Guidelines outlined in Section 202.03 of the Standard Specifications should be followed.

3. Method of Measurement. This work will be measured per each manhole/handhole cleaned.
4. Basis of Payment. This work will not be paid separately but will be included in the cost of the contract.

**CONDUIT IN GROUND, 3" DIAMETER, GALVANIZED STEEL
CONDUIT IN TRENCH, 3" GALVANIZED STEEL**

1. Description. - This work will consist of furnishing and installing a conduit lateral of the type and size specified.
2. Materials. Galvanized rigid steel conduit and PVC coated steel conduit must conform to the requirements of Material Specification 1462.

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

Coilable non-metallic conduit must be a high density polyethylene meeting the requirements of Material Specification 1533 and ASTM-D1248, Type III, Grade PE34, Category 5, and Class C. The duct must meet the requirements of Section 1088.01(c) of the Standard Specifications. The average outside diameter of the 1.25 inch duct must be 1.66 inches, with a minimum wall thickness of .15 inches for the Schedule 40 conduit, and a wall thickness of .20 for the Schedule 80 conduit. Conduit color will be as determined by the Resident Engineer.

Aluminum conduit will be rigid wall conduit with a minimum wall thickness of 0.099". The conduit will be extruded from 6063 aluminum alloy and tempered to T-1. Aluminum conduit must meet the requirements of UL-6 and ANSI C80.5.

3. Construction.

Definition of Laterals - A lateral will mean a conduit raceway extending from one sub-surface location to another sub-surface location, and in every case intended to encase electric circuit cable under paved surfaces, or in unpaved parkway, street or alley, where specifically designated.

Locations - Laterals must be installed at the locations shown on the construction plans. Laterals must be installed in the shortest practicable line between points of termination, or under adverse conditions, as directed by the Resident Engineer. Laterals not shown on the drawing, but necessary to be installed will be paid for at the unit price bid for laterals as additional units of construction.

Installation Requirements - Galvanized rigid steel conduit may be installed in a trench, pushed underground, or attached to a structure. PVC conduit will normally be installed in a trench or attached to a structure. Coilable conduit will be installed in a trench. The Contractor must exercise care in installing the conduit to ensure that it is smooth, free from sharp bends or kinks, and has the minimum practicable number of bends. Crushed or deformed conduit will not be accepted. All conduit and fittings must have the burrs and

rough places smoothed, and all conduit runs must be cleaned and swabbed before installation of electric cables. If cable is not to be installed immediately after cleaning of the conduit, a light weight pulling line such as 1/8" polyethylene line must be placed in the conduit and will remain in the conduit for future work. The excavation for pushing conduit must be located at least two feet (2') from the edge of pavement. All underground conduits must have a minimum cover of thirty inches (30") below grade. If conduit cannot be installed with a minimum cover of thirty inches (30"), the conduit must be encased in concrete for protection. The method of encasement and protection must be approved by the engineer. Concrete encasement will be paid for as a separate pay item.

When multiple laterals in a common trench are required, no more than three (3) three inch (3") or smaller conduit laterals can be laid on a single, horizontal level. Four or more conduit laterals must be installed on two (2) levels in accordance with instructions of the Resident Engineer.

Conduit laterals attached to a structure must be flush to the structure where possible. Clamps or hangers must be used at a maximum interval of five feet (5') to hold the conduit rigidly in place. Fittings must be supplied and installed that are compatible with the conduit in use. Expansion couplings must be used at locations where the conduit crosses expansion joints in the structure.

Conduit laterals installed under vaulted walks must be securely attached to the retaining wall by means of galvanized clamps and clamp backs held in place by anchor bolts. Laterals will be fastened as close to the underside of the sidewalk as possible, and securing clamps installed every five feet (5'). Laterals must be continuous through party walls.

Threaded fittings and bends of the same material as conduit must be furnished and installed as required. Threadless couplings may be used only for splicing existing conduit. All conduit splices, where required, will be considered incidental to this pay item.

4. Method of Measurement. The length measured will be the number of lineal feet of conduit installed and accepted, measured in place. Each conduit will be measured separately even if in a single trench. The length for measurement will be the distance horizontally between changes in the direction of the conduit plus the conduit vertically attached to structures. All conduit on structures will be measured from point to point, whether vertical or horizontal.
5. Basis of Payment - This work will be paid for at the contract unit price per lineal foot for Conduit of the type and size as specified, which price will be payment in full for furnishing and installing the conduit and fittings complete. Cleaning, swabbing, and p-lining of new conduit will be incidental to this pay item. Hangers, clamps, and fittings for conduit attached to structure will be incidental to this item. Trench and backfill will be paid for separately. Concrete encasement, if required, will be paid for separately. No additional payment will be allowed for pushing under pavements or for jackholes for conduit laterals.

ROD AND CLEAN DUCT IN EXISTING CONDUIT SYSTEM

1. Description and Scope. This work will consist of inserting a duct rod or electrical fish rod or tape of sufficient length and rigidity into an electrical conduit opening in one electrical manhole or handhole, and pushing the said rod through the conduit to emerge at the next or subsequent manhole in the conduit system at the location shown on the plans. The duct

rod may be inserted and removed by any standard construction method which causes no damage to the conduit system. The size of the conduit may vary from two inch (2") to four inch (4"), but there will be no differentiation in cost for the size of the conduit.

The conduit system which is to be rodded and cleaned may exist with various amounts of standing water in the manholes. The contractor must pump the water or sufficient water from the manholes to drain the conduit and to afford compatible working conditions for the installation of the duct rods and/or cables. The pumping of the manholes will be incidental to the work of rodding and cleaning of the conduit.

Any manhole which, in the opinion of the Resident Engineer contains excessive debris, dirt or other materials to the extent that conduit rodding and cleaning is not feasible, will be cleaned at the Engineers order and payment approved as a separate pay item, and not a part of this specification.

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

2. Method of Measurement. This work will be measured per lineal foot for each conduit cleaned. Measurements will be made from point to point horizontally. No vertical rises will count in the measurement.
3. Basis of Payment. This work will not be paid for separately but will be included in the cost of the contract.

CONCRETE FOUNDATIONS (SPECIAL)
CONCRETE FOUNDATION FOR TYPE "P" BASE MOUNTED TRAFFIC SIGNAL CONTROLLER

1. Description. This item will be for all work necessary for installing a foundation for a "P" cabinet, or a foundation for a "Super P" cabinet.
2. Material. Concrete will be Portland cement concrete, SI Class, meeting the requirements of Article 1020 of the Standard Specifications. Ground rods will meet the requirements of Material Specification 1465. Conduit will be PVC meeting the requirements of Material Specification 1533. Anchor rods will meet the applicable requirements of Material Specification 1467.
3. Construction. The Contractor will install a concrete foundation for a base mounted traffic signal controller cabinet, as shown on City of Chicago Drawing Number 888 for a "P" cabinet, or as shown on Drawing 888A for a "Super P" cabinet. Work under this item will

be performed in accordance with Article 800 of the Standard Specifications.

The foundation will have a minimum depth of at least forty inches (40") below grade and must have large radius conduit elbows in quantity, size and type shown. The elbow ends above ground will be capped with standard conduit bushings. The ground rod will be installed adjacent to the foundation, and will be driven straight down with the top to be no higher than 30 inches below finished grade. The Contractor will furnish anchor bolts, hardware, conduit elbows, and all other material shown on the foundation construction drawing.

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

4. Method of Measurement. This work will be measured as each for each unit installed complete.
5. Basis of Payment. Unit price will include cost of all material and labor required to install this foundation, as per applicable construction plans and these specifications. The conduit elbows will be considered as part of the foundation and will not be paid for as a separate item or as part of the conduit laterals leading to the foundation. All necessary excavation and restoration of parkway to the original condition will be included in the unit price. Any sidewalk removal will be paid for as a separate pay item. However, any restoration of sidewalk will be considered as part of this item, including any expansion joint between the sidewalk and the foundation. This work will be paid for at the Contract Unit Price of EACH for CONCRETE FOUNDATIONS, (SPECIAL).

CONCRETE FOUNDATION, 24" DIAMETER, 1 1/4" ANCHOR RODS, 15" BOLT CIRCLE, 9 FEET
CONCRETE FOUNDATION, 24" DIAMETER, 1 1/4" ANCHOR RODS, 15" BOLT CIRCLE, 7 FEET
CONCRETE FOUNDATION, 30" DIAMETER, 1 1/4" ANCHOR RODS, 17 1/4" BOLT CIRCLE, 9 FEET

1. Description. The foundation will be a poured in place concrete structure used for structurally supporting street light poles or traffic signal poles.
2. Material. Concrete must be Portland cement concrete meeting the requirements of Article 1020 of the Standard Specifications for SI Class concrete. Reinforcement bars must meet the requirements of Section 1006.10 of the Standard Specifications. Anchor rods must meet the requirements of Material Specification 1467 and the ground rod must meet the requirements of Material Specification 1465. Conduit elbows must be PVC conduit meeting the requirements of Material Specification 1533.
3. Construction. Every foundation will be installed at the location designated and in the manner herein specified or in special cases as specifically directed. The contractor will locate foundations as per plan or as directed by the Resident Engineer. A hole must be augered for placement of the concrete form.

Item 151 is a foundation for a traffic pole which can accommodate a 16, 20, or 26 foot monotube arm (Standard Drawing 818). Item 152 is a foundation for a traffic pole which can accommodate a 30 foot monotube arm (Standard Drawing 816). Item 153 is a foundation for a traffic pole which can accommodate a 35, 40, or 44 foot monotube arm (Standard Drawing 817). Item 151A is a foundation for arterial street light pole; either steel

or aluminum, conventional or davit (Standard Drawing 818). Item 151B is a foundation for the Chicago 2000 Gateway and Pedestrian ornamental light poles (Standard Drawing 953). Item 152A is a foundation for both the Extended Loop pole and the Loop pole (Standard Drawing 956). Item 180 is an offset foundation for an arterial street light pole (Standard Drawing 937). Item 181 is an offset foundation for a residential street light pole (Standard Drawing 937, with exception that pole base is 20" diameter with 1" anchors in a 10" bolt circle).

Top surface of these foundations in parkway will be at an elevation of two inches (2") above grade or as required by the Engineer. Care must be taken to install a level foundation and to ensure adequate anchor rod projections for double-nut installation. The foundations must be centered back from the face of the curb in accordance with dimensions shown on the construction plans. Foundation raceways must consist of large radius conduit elbow(s) in quantity, size and type as specified on the corresponding standard drawing or in the construction plans. Any number of elbows in excess of the number shown on the standard drawing must be paid for under a separate pay item. The elbow ends above ground will be capped with standard conduit bushings. The Contractor must furnish anchor rods, a ground rod, hardware, conduit elbow(s) and all other material shown on applicable foundation construction drawings. Depth of foundation will be as shown on the appropriate drawing. The foundation top must be chamfered 3/4 of an inch. When the foundation is installed in a sidewalk, the foundation must be installed level, with the height of the foundation as close to the height of the sidewalk as possible, or as directed by the Engineer. A proper expansion joint will be installed between the sidewalk and the foundation.

Anchor rods must be set in accordance with applicable construction plans so that when poles are mounted on the foundations, the street lighting mast arm will be properly oriented as indicated on the construction plans. The anchor rods will be set by means of a metal template which shall be submitted for approval before any foundation work is begun. The template must hold the rods vertical, and in proper position. Anchor rods must conform in all respects to the appropriate City drawing.

4. Method of Measurement. This item will be measured per each foundation installed complete.
5. Basis of Payment. Payment will be made for foundations installed in place, including elbows, in accordance with construction drawings, constructions plans and these specifications. All necessary excavation and restoration of pavement, sidewalk and fill to their original conditions will be included in the unit price. This work will be paid for at the contract unit price per each, or per lineal foot, as specified in the contract, for CONCRETE FOUNDATION of the diameter and size specified. The offset foundation will be paid for per each.

POLE STEEL, ANCHOR BASE, 10" DIAMETER, 7 GAUGE, 34'-6"
POLE STEEL, ANCHOR BASE, 10" DIAMETER, 3 GAUGE, 34'-6"
POLE STEEL, ANCHOR BASE, 11" DIAMETER, 3 GAUGE, 34'-6"

1. Description. This item will consist of furnishing, installing, and setting plumb a steel anchor base pole to which equipment may be attached for the extension of the City street light and traffic signal systems.

2. Material. The material of the pole must meet the requirements of Material Specification 1447.
3. Installation. The pole must be installed on the concrete foundation designed for the particular pole usage as indicated on the plans or as directed by the Engineer. Double nut construction must be used as shown on Drawing 837. Double nut construction provides the proper ventilation, as well as providing a way to plumb the pole. Any exposed portions of anchor rods extending above the nuts which interfere with the installation of the bolt covers must be cut off to provide the necessary clearance. The excess must not be burned off. The pole must be set secure, properly orientated, and plumb using the nuts and washers provided with the anchor bolts. The bolt covers, handhole cover, and pole cap must be securely attached.

The contractor will utilize non-abrasive slinging materials and will otherwise exercise due care in erecting the pole and mast arm to minimize any possible damage to the finish. When necessary, the contractor will utilize, at his own expense, factory approved touch-up materials and methods to restore the finish to like new appearance and durability.

4. Method of Measurement. This item will be measured per each unit installed, complete with anchor bolt covers, pole cap, and handhole cover.
5. Basis of Payment. This work will be paid for at the Contract unit price each for a POLE, STEEL, ANCHOR BASE, 34'-6", which will be payment in full for furnishing and installing the pole complete in place. Light standard foundations, mast arms, and luminaires will not be included in this pay item but will be paid for separately.

SIGNAL HEAD, POLYCARBONATE, LED 1-FACE, 3-SECTION, BRACKET MOUNTED

1. Description. This item will consist of furnishing and installing a traffic signal head or combination of heads on a street light pole, a traffic signal pole, or a traffic signal post as shown on the plans, as specified herein, or as directed by the Engineer. Specific installations and configurations are shown on Drawing Numbers 834 and 835, entitled "Standard Traffic Signal Mounting Details".

The type of installation will be as indicated on the plans. The number of signal faces, the number of signal sections in each signal face, any dual-indication sections, and the method of mounting will be as indicated in the plans and in the standard drawings.

Each signal face must be pointed in the direction of the approaching traffic that it is to control and must be aimed to have maximum effectiveness for an approaching driver located at a distance from the stop line equal to the normal distance traversed while stopping.

During construction and until the installation is placed in operation, all signal faces must be hooded. The hooding material must be securely fastened so it will not be disturbed by normal inclement weather or wind.

2. Material. The traffic signal must meet the requirements of Material Specification 1493 for LED signals. The mounting brackets must meet the requirements of Material Specification 1495.

3. Installation. The signals must be mounted using pole mounting brackets banded to the pole with two strips of 3/4" stainless steel banding single wrapped, one at the top and one at the bottom of the brackets, each secured with a stainless steel banding clip. The banding and clips will be coated with a baked-on black finish. The mounting configuration connecting the signals to the mounting bracket must consist polycarbonate brackets specifically made for mounting signal heads to the side of poles, to create the designated structure. When the signals are to be mounted on a square pole or flat surface, the bracket used will be bolted to the flat pole or surface using 3/8" drive studs where permissible or using a 3/8" studs in a tapped hole.

The bottom mounting bracket must be accurately located to cover an opening 1" in diameter, for cable entrance, drilled into the pole or standard at a calculated height to position the bottom signal face at a standard height of 10 feet, or a height indicated on the plans. The opening must be reamed or filed to remove all sharp edges or burrs which might damage cable during installation, or through vibration when the signals are in operation.

Cable. The Contractor must provide and install a length of 8/C #16 AWG, as per Specification 1475, flexible electrical cord, medium duty, of sufficient length to extend without strain or stress from the terminal strip in the "Green" section of the signal head to the terminal strip in the junction box mounted on the pole. The number of conductors in the cord, and the color coding of the conductors, must be sufficient to match the requirements of the signal head being installed, and must be connected in accordance with Specification 1493. Both ends of the cable length must be carefully stripped of six inches (6") of jacket and one inch (1") of insulation, and each conductor properly tinned. The service cable from the signal heads must enter the pole through the bottom mounting bracket and enter the long sweep elbow to terminate by attachment to the terminal strip in the junction box in accordance with connector schematic, Bureau of Electricity Drawing Number 12268-A

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

SIGNAL HEAD, POLYCARBONATE, LED 1-FACE, 3-SECTION, MAST ARM MOUNTED

1. Description. This item will consist of furnishing and installing a traffic signal head on a traffic signal monotube mast arm, as shown on the plans, as specified herein, or as directed by the Engineer. Specific installations and configurations are shown on Drawing 834 entitled "Standard Traffic Signal Mounting Details".

Each signal face must be pointed in the direction of the approaching traffic that it is to control and must be aimed to have maximum effectiveness for an approaching driver at a distance from the stop equal line to the normal distance traversed while stopping. The optically programmed signal face must be programmed in accordance with the visibility requirements of the Traffic Engineer.

During construction, and until the installation is placed in operation, all signal faces must

be hooded. The hooding material must be securely fastened so it will not be disturbed by normal inclement weather or wind.

2. Material. The traffic signal head construction must meet the requirements of Material Specification 1493 for LED traffic signals. The material for a programmed LED traffic signal head must meet the Material Specification 1543. The mast arm bracket must meet the requirements of Material Specification 1463. The cable must meet the requirements of Material Specification 1475.
3. Installation. The signal must be mounted on the mast arm at the position indicated on the drawing in the manner shown on Drawing 834. The bracket must be banded to the mast arm with the 5/8" banding as shown on Drawing Number 834. The banding and clips must have a baked-on black finish. The bracket must be located over a hole drilled into the mast arm for the installation of cable. The hole must be reamed or filed to remove any sharp edges or burrs which might damage cable during installation, or through vibration when the signals are in operation.

Cable. The contractor must provide and install a length of 8/C #16 flexible electrical cord, of sufficient length to extend without strain or stress from the terminal strip in the "Green" section of the signal head to the terminal strip in the junction box mounted on the pole. The number of conductors in the cord, and the color coding of the conductors, must be sufficient to match the requirements of the signal head being installed, and must be connected in accordance with Material Specification 1493 for LED traffic signals, or Material Specification 1543 for optically programmed LED traffic signals. Both ends of the cable length must be carefully stripped of six inches (6") of jacket and one inch (1") of insulation, and each conductor properly tinned. The service cable from the signal heads must enter the traffic signal mast arm through the hole from the mounting bracket, whence it will continue and enter the pole through the hole for mast arm wiring, then extend downward through the pole to enter the long sweep elbow to terminate by attachment to the terminal strip in the junction box in accordance with the terminal strip connector schematic, Bureau of Electricity Drawing Number 12268-A.

The mast arm brackets must be painted gloss black or another color as indicated in the plans.

4. Method of Measurement. This work will be measured per each signal unit installed, completely wired and operational.
5. Basis of Payment. This work will be paid for at the contract unit price each for SIGNAL HEAD or OPTICALLY PROGRAMMED SIGNAL HEAD of the type specified which price will be payment in full for furnishing and installing the signal head, or the optically programmed signal head, complete.

REMOVE EXISTING LIGHTING SYSTEM

1. Description. This work will consist of removing all obsolete street lighting equipment at various locations shown on the plans.
2. Removal. Street lighting poles (anchor base or embedded), ballast housing bases, mast arms, luminaires, controllers, secondary racks, cable and all related equipment are to be removed as indicated on the plans. Embedded poles will be removed by means other than

burning where possible. Embedded CTA poles must be burned off at a minimum of eighteen inches below ground level.

All equipment, with the exception of the cable, will remain the property of the City of Chicago. The Contractor must deliver the obsolete street lighting equipment to the City of Chicago Yard at 4100 South Cicero Avenue, Chicago, Illinois. Twenty four hours advance notice is necessary before delivery. Street lighting cable must be removed as indicated on the plans, and become the property of the Contractor to be disposed of by him, outside the right of way, at his sole expense.

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

3. Method of Measurement. This work will be measured per lump sum for the project contract. Removal of manholes, foundations, and conduit will not be part of this item.
4. Basis of Payment. This work will be paid for at the contract lump sum price for REMOVE EXISTING LIGHTING SYSTEM at the various locations shown on the plans. This price will be payment in full for removing the equipment and disposing of it as required. The salvage value of the cable retained by the Contractor must be reflected in this contract lump sum price.

INTERCEPT EXISTING CONDUIT FOR LIGHTING CONTROLLER INTERCEPT EXISTING CONDUIT

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

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

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

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

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

POLE, STEEL, ANCHOR BASE, 8-1/2" DIAMETER, 3 GAUGE, 32' - 6"

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 Specification 1447.

Installation. The pole will be installed on a parapet wall where the anchor rods have been integrated into the wall and are at the proper bolt circle. Double nut construction as shown on Drawing 837 must be used. 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 with a saw to provide the necessary clearance. The excess must not be burned off. The pole will 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. It will not include the luminaire arm or the luminaire, which will be separately measured.

Basis of Payment. This work will be paid for at the Contract unit price each for a POLE, STEEL, ANCHOR BASE, 32'-6", which will be payment in full for furnishing and installing the pole complete in place. Light standard foundations and anchor rods will not be included in this pay item but will be paid for separately, as will the mast arms, and luminaires.

BASE, BALLAST HOUSING, STEEL, 7 GAUGE

Description. This work will consist of furnishing and installing a ballast housing on a concrete foundation, as shown on the plans or as directed by the Engineer. The foundation must have either a 10 inch or 15 inch bolt circle.

Material. The ballast housing must meet the requirements of Material Specification 1375, and Standard Drawing 785.

Installation. The ballast housing must be installed onto the foundation using the hardware provided for the foundation anchor rods. No double nutting or shims will be used.

Basis of Payment. This work will be paid for at the contract unit price per each BASE, BALLAST HOUSING, STEEL, 7 GAUGE, which will be payment in full for furnishing and installing the base.

MAST ARM, STEEL, 15 FOOT

1. Description. This item will consist of furnishing and installing a steel pipe mast arm of a specified length to support a street light luminaire, or other electrical equipment as required, as is shown on Drawing Numbers 661, 620, 839, and 840.

2. Material. The material of the mast arm must conform to the requirements of Material Specification 1450. The 4 foot arm must conform to Standard Drawing 661. The 8 foot mast arm must conform to Standard Drawing 620. The 12 foot mast arm must conform to Standard Drawing 839. The 15 foot mast arm must conform to Standard Drawing 840. The two bolt arm attachment must be equal to that shown on Standard Drawing 724. The 1 foot mast arm will be a 4 foot arm cut to the desired length.
3. Installation. The 1 foot, 4 foot, and 8 foot mast arms will be installed with two bolts to the mast arm attachment on the pole. The pole must have a mast arm attachment as shown in Standard Drawing 659 in order to properly mount the arm. The truss arms require 2 such mounts. The 12 foot and 15 foot truss arms will be attached with 4 bolts. Bolts will be supplied with the arm per Material Specification 1450.
3. Method of Measurement. This work will be measured per each unit installed.
4. Basis of Payment. This work must be paid for at the contract unit price each for a MAST ARM, STEEL, of the length specified, which will be payment in full for furnishing and installing the mast arm complete in place.

LUMINAIRE, STREET LIGHT, HPS, 400 WATT, 240 VOLT, ARTERIAL SEMI-CUTOFF

1. Description. This item will consist of furnishing and installing a street lighting luminaire, complete with internal ballast, electronic starting component, and a high pressure sodium vapor lamp of the proper wattage and input voltage, on a street light mast arm attached to a street light pole, or a floodlight mounted to a post top attachment on a street light pole, and connecting the unit to either an underground cable distribution system or an aerial wire distribution system at the location shown on the plans, or as directed by the Engineer.
2. Material. The luminaire must meet the appropriate material specification for the lamp wattage and type of distribution specified. Items 224, 225, 226, 227, 228, 229, 229A, 2973, 2972, 230, and 280 must meet Material Specifications 1359, 1359, 1368, 1368, 1382, 1499, 1376, 1492, 1501, 1498, and 1498, respectively. Lamps for these items must meet Material Specification 1524.
3. Installation. The luminaire must be securely installed on the mast arm. The vertical axis of the luminaire must be in a vertical plane, and the longitudinal axis must be leveled as specified in shop drawings supplied by the manufacturer to produce the desired distribution pattern with the lamp socket secured in the required position for that distribution. Floodlights must be mounted on the pole top using a bracket supplied with this item. The bracket will be for one or two fixtures, as specified, or as directed by the Engineer. Floodlights must be aimed for proper light distribution. For an aerial distribution system, the primary wiring to the ballast must consist of 2 1/C #12 AWG wires, with 150 degree C. irradiated polyolefin insulation, connected to the terminal board "line" terminals. They must extend through the mast arm and exit from the mast arm through the grommet in the hole provided for this purpose, and extend further forming a drip loop and connect with aerial circuit wires. Connection to the aerial circuit wires must be made with a split bolt type pressure connector for a No. 6 solid copper wire and the connection so formed must be wrapped with two layers of an approved electrical tape.

A cartridge type fuse, type KTK, rated at 10 amperes must be installed in each of the fuse

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

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

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

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

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

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

4. Method of Measurement. This work will be measured per each unit installed, complete. All wiring to the underground feeder cable, including splices, will be included in this measurement.
5. Basis of Payment. This work will be paid for at the contract unit price each for a LUMINAIRE, STREET LIGHT, HPS, of the proper wattage, voltage, and distribution type, which will be payment in full for furnishing, installing, connecting and testing the unit complete in place.

CABLE IN CONDUIT, TRIPLEX 2 1/C NO.6,1/C NO.8 GROUND

1. 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.
2. Material. The cable must meet all requirements of Material Specification 1534 of the

Bureau of Electricity, City of Chicago.

3. Construction Method. All cables must be installed with care to prevent damage to the cable. Any defects found in the cable must be reported to the resident engineer. Damaged cable must be replaced.

The cable must be pulled into the conduit with a minimum of dragging on the ground or pavement. This will be accomplished by means of reels mounted on jacks or other suitable devices located for unreeling cable directly into duct. Lubricants must be used to facilitate installation if deemed necessary by the contractor.

Bends in the cable will conform to the recommended minimum radii as outlined in the National Electric Code.

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

Where cable runs continue from manhole to manhole without tapping within a light pole, they will be continuous without splices unless authorized by the resident engineer.

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.

4. 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.
5. 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, 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 contract plans.

POLYMER CONCRETE HANDHOLE, 12" X 20" X 12" DEEP

Description: This work shall consist of furnishing and installing handhole or junction box, fittings, and accessories, of the type and size specified, as shown on the Plans and as directed by the Commissioner. Work under this item shall be performed in accordance with Section 814 of the Standard Specifications and as specified herein.

Location: Each handhole or junction box shall be installed in paved sidewalk, at location specified on the construction plans or at other locations as directed by the commissioner.

Materials: Materials shall be according to the following articles of Standard Specifications Section 1000-Materials:

Item	Article / Section
Requirement	
a. Composite Concrete Handhole	1088.05

Handhole shall be provided with pulling eye and wall cable supports.

Basis of Payment: This work will be paid for at the contract unit price each for POLYMER CONCRETE HANDHOLD, 12”X18”X12” DEEP of the type and size as specified. Which price shall be payment in full for furnishing and installing complete. No additional compensation will be allowed for constructing the handhole on existing conduits.

**CONTROLLER (SPECIAL)
CONTROLLER, TRAFFIC, 12 LOAD BAY, P CABINET**

1. Description. This work will consist of furnishing and installing a traffic signal controller and associated equipment in a cabinet onto a foundation and making all necessary connections.
2. Material. The material must meet the requirements of Material Specification 1469. The cabinet will be a P cabinet 55 inches high by 44 inches wide by 26 inches deep with 12 load bays. Each load bay must include a load switch. No communications interface equipment will be included.
3. Procurement. The contractor must provide Request for Inspection of Material forms for traffic signal controllers and cabinets at the Preconstruction Meeting. The Bureau of Electricity will review and comment on the submitted material. The Bureau of Electricity will approve the purchase of the material from a supplier. Final material approval will be made in accordance with Bureau of Electricity specifications. The Contractor must provide proof of purchase to the Resident Engineer within seven (7) days following approval by the Bureau of Electricity 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 Commissioner determines the requirements are met.

The controllers and cabinets are to be delivered to the Bureau of Electricity within ninety (90) days of purchase. If the controllers and cabinets are not delivered, payment will be withheld until such time that the controllers and cabinets are delivered.

The Bureau of Electricity will notify the Contractor when the material has been inspected and approved. Within forty-eight (48) hours of notification, the Contractor will pick-up the controllers and cabinets from the Bureau. The controllers and cabinets will be stored at a facility, approved by the Commissioner, at the contractor’s expense.

4. Installation. The controller will be programmed to provide the sequencing and timing of operation as shown on the plans. The controller must be enclosed in a housing and

installed in a completely wired cabinet. The model and serial numbers of the controller must be affixed on the front of the controller housing and be readily visible.

The cabinet must be set onto a pad foundation designed specifically for the cabinet, and affixed with 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.

5. Basis of Payment. This work will be paid for at the contract unit price for each CONTROLLER (SPECIAL), which price will be payment in full for furnishing and installing the controller complete and operational, with all wiring and connections as specified.

SERVICE INSTALLATION, SPECIAL SERVICE INSTALLATION 100 AMP

1. Description. This work will consist of furnishing and installing a service on a Commonwealth Edison Company wood pole for either a 120 volt traffic signal service installation, or for a 240 volt street lighting service installation per City of Chicago Drawing Number 11925.
The 100 ampere installation can be used for either a 120 volt or 240 volt service.
2. Service Junction Cabinet. The cabinet must be cast from aluminum and met all the requirements of standard drawing 11922. Its dimensions must not exceed eight (8) inches in width, eighteen (18) inches in height and nine (9) inches in depth, and it must be weather proof. It must contain a two (2) pole disconnecting device, with bridge contacts and barrier strip, subject to approval. The disconnecting device must be rated for 200 amps and 600 volts. A suitable ground lug, subject to approval, to accommodate a 1/C #2, 1/C #4, 1/C #2/0 or 1/C #1/0 AWG stranded copper conductor must be provided. Any alternate cabinets which are considered equal to this may be considered.
3. Cable Grip. A one and one quarter inch (1 1/4") cable grip fitting must be installed at top of cabinet to accommodate a 3/C #2, #4, #2/0 or #1/0 AWG service cable.
4. Service Riser. A two (2) inch galvanized rigid steel conduit riser terminated at the bottom with a galvanized rigid steel, large radius, conduit elbow must be installed by the contractor on the Commonwealth Edison Company service pole as shown on City of Chicago Drawing Number 11925. The top of the riser must terminate in the service junction cabinet and the end of the elbow must connect to the horizontal conduit lateral leading to the control cabinet. Payment for the riser, elbow, and attachments must be included in the price bid for the complete Commonwealth Edison Company pole service junction unit. The laterals will be paid for separately under different pay items.

5. Cable. A sufficient length of three (3) conductor service entrance cable must be coiled at the top of the box in order to reach the Commonwealth Edison Company secondary wires for connection. The three (3) conductor service entrance cable must meet the requirements of Bureau of Electricity Specification Number 1457, or an approved equal. The black and red conductors must be connected to the disconnect device and the white conductor to the ground lug, for the 240 volt street lighting service installation. The black conductor must be connected to the disconnect, and the white to the ground lug, for the 120 volt traffic signal service installation. The red conductor must be taped and coiled inside box for future use.
6. Cables in Service Riser. Cables must extend continuously from the load side of the disconnect device, down the riser and elbow, and in the conduit lateral to the control cabinet. Payment for cables in riser and elbow will be included in separate pay items, and will not be considered as part of this pay item.
7. Basis of Payment. This work will be paid for at the contract unit price EACH for SERVICE INSTALLATION (SPECIAL), which price must be payment in full for furnishing and installing the service equipment complete. Any charges by the utility company to provide electrical service to the service installation will be paid for by the contractor.

MATERIAL SPECIFICATION	DRAWING
1457	11922
1462	11925

CONTROLLER, STREET LIGHT, BASE MOUNTED, 1 PHASE, 100 AMP

1. Description. This work will consist of furnishing and installing an aluminum cabinet to be mounted on a ballast housing base, and containing various electro-mechanical devices to automatically control street lighting circuits, and to provide protection for the equipment so controlled.

The controller specified will be equated to the service capability of the Commonwealth Edison Company at the given location and to the number of circuits to be serviced as required by the plans.

2. Material and Assembly. The aluminum controller cabinet and electro-mechanical control devices must meet the requirements of Material Specification. 1497.

The electro-mechanical devices within the cabinet must be attached to a 3/8 inch thick phenolic, linen base, bakelite panel drilled to accommodate the various devices with allowable clearances, and secured in the cabinet with 5/16" - 18 NC x 7/8" stainless steel machine screws, as per Drawing 887(3-phase, 100amp), 883(3-phase, 200amp), 884(1 phase, 100amp), or 886(1-phase, 200amp).

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

3. Installation. The controller must be wired as shown on Drawing 862(100 or 200 amp, 1-phase, with 120 volt photocell), 863(100 amp, 1-phase, with 240 volt photocell), or 864(100

or 200 amp, 3-phase). For a 100 ampere controller the main circuit breaker and the contactor must each have a 100 ampere rating, and the branch circuit breakers must be as indicated on the plans. For a 200 ampere controller the main circuit breaker and the contactor must each have a 200 ampere rating, and the branch circuit breakers must be as indicated on the plans. For a three phase service, a three pole main circuit breaker and three pole contactor of the corresponding ampere rating must be installed and the branch circuit breaker ampere ratings must be as indicated on the plans.

For grounding the cabinet, a bare copper wire, #4 AWG, must be attached from the ground lug in the cabinet to the grounding clamp on the ground rod.

The cabinet must be installed on a ballast housing base, 20 inches in height secured to a concrete foundation as shown on Drawing 876(110 amp) or 880(200 amp), at the location indicated on the plans. The ballast housing base must meet the requirements of Material Specification 1375. The ballast housing must be part of this pay item. The foundation, including anchor rods, washers, and nuts will be a separate pay item.

The installation of feeder cables and branch circuit cables will be performed in a neat and workmanlike manner with all cable trained around the cabinet, secured to the proper terminals and identified either by tagging of the cables, or by identification of the branch breakers, all as part of the controller installation and not as a separate pay item.

The lighting circuit will be placed in operation as soon as practicable with the Contractor being charged for the energy until the circuits are accepted by the City of Chicago, Bureau of Electricity.

4. Basis of Payment. This work will be charged for at the contract unit price each for a CONTROLLER, STREET LIGHT, BASE MOUNTED of the proper phase and amperage, and will be payment in full for furnishing and installing the controller complete in place.

MATERIAL SPECIFICATION

1428
1375
1497

DRAWING

736 785 862 863 864
876 880 883 884 886
887

CIRCUIT BREAKER, 1-POLE, 30 AMPERE, 600 VOLT IN STREET LIGHT CONTROLLER

1. Description. This item will consist of furnishing and installing a single pole thermal-magnetic circuit breaker in an existing arterial street light controller at the designated location creating a controlled power source to supply a proposed CTA bus shelter.
2. Material. The material of the circuit breaker must meet the requirements of Specification 1428.
3. Installation. The circuit breaker must be mounted on a 3/8" thick phenolic linen base bakelite panel 3" x 8" which will be attached on the inside of the lower left hand side of the controller cabinet with 4-1/4"-20x7/8" brass screws in holes which will be drilled and tapped into the side of the cabinet for this purpose. The ends of any screws protruding through the side of cabinet wall must be filed or ground off flush with the face of the cabinet. The bakelite panel shall be set out from the wall of the controller cabinet using four 1/4" bakelite

spacer washers, one at each mounting screw position.

The line side terminal of the circuit breaker must be connected to one of the line side terminals of the main circuit breaker with a 1/C - #4 - 600V - 90 degree C. - insulated copper cable trained around the cabinet in a neat and workman like manner. This cable will be a part of the installation of the circuit breaker and will not be a separate pay item. The installation and connection of the load side cables servicing the traffic signal controller will be a part of the installation of service cable and not a part of the installation of the circuit breaker.

4. Basis of Payment. This item will be paid for at the contract unit price each for a CIRCUIT BREAKER IN STREET LIGHT CONTROLLER complete in place which will constitute payment in full for furnishing, installing and making line side connections of the circuit breaker.

MATERIAL SPECIFICATION 1428

THERMAL MAGNETIC CIRCUIT BREAKER

SUBJECT

1. This specification covers the requirements for thermal-magnetic circuit breakers capable of providing complete over-current protection for street lighting branch-load and service circuits.

GENERAL REQUIREMENTS

2. (a) Sample. One complete circuit breaker of each type and size, and of the manufacture intended to be furnished must be submitted upon request of the Chief Procurement Officer within fifteen (15) business days after receipt of such request. The sample(s) must be delivered to the Engineer of Electricity, Bureau of Electricity, 2451 South Ashland Avenue, Chicago, Illinois 60608.
- (b) U.L. Approval. Circuit breakers furnished under this specification must be listed and approved by Underwriter's Laboratories, Inc.
- (c) Applicable Specifications. Where reference is made to applicable requirements of Underwriter's Laboratories, Inc., Bulletin #489, entitled "Standard for Branch Circuit and Service Circuit Breakers," hereinafter cited as the U.L. Standards, the most recently published revision will govern.
- (d) Assembly. Each circuit breaker must have the thermal-magnetic trip installed, calibrated and sealed within its insulated housing.
- (e) Instructions. Complete installation instructions, details on wiring, and information on operation must be furnished with each circuit breaker, except as otherwise indicated.
- (f) Packing. Each circuit breaker must be packed in a suitable manner so that it will not be damaged in shipping or handling.

TYPES AND SIZES

3. (a) EHD Frame Circuit Breakers. For use on A-C Systems with a 100-ampere frame; minimum interrupting rating of 18,000 R.M.S. symmetrical amperes at 240 volts A.C.
 1. Single pole, 240 or 480 volts A.C., ampere rating from 15 to 100.
 2. Double pole, 240 or 480 volts A.C., ampere rating from 15 to 100.
- (b) FDB Frame Circuit Breakers. For use on A-C Systems with a 150 ampere frame; minimum interrupting capacity of 18,000 R.M.S. symmetrical amperes at 240 volts A-C.
 1. Double pole, 240, 480 or 600 volts A-C, ampere rating from 15 to 150.
 2. Triple pole, 240, 480 or 600 volts A-C, ampere rating from 15 to 150.
- (c) JDB Frame Circuit Breakers. For use on A-C Systems with a 250 ampere frame; minimum interrupting current of 65,000 R.M.S. symmetrical amperes at 240 volts A-C.
 1. Double pole, 240, 480 or 600 volts A-C, ampere ratings from 70 to 250.
 2. Triple pole, 240, 480 or 600 volts A-C, ampere ratings from 70 to 250.

DESIGN AND CONSTRUCTION

4. Circuit breakers furnished under this specification must include the following design and construction features: (1) molded insulated housing, (2) thermal-magnetic trip mechanism, (3) silver alloy contacts, (4) corrosion-resistant internal parts, (5) trip-free, indicating handle, and (6) pressure-type terminals.

DETAIL REQUIREMENTS

5. (a) Thermal-Magnetic Trip Mechanism. The breaker must be activated on current overload by means of a thermal-magnetic trip mechanism. This mechanism must be non-adjustable, non-interchangeable, and factory calibrated and sealed. Instantaneous tripping as controlled by the magnetic trip setting, and time delay tripping accomplished by thermal action must be in accordance with the manufacturer's published characteristic curves for these breakers or with calibration requirements of the U. L. Standards, as applicable.
- (b) Contact Mechanism. The contacts must be spring loaded and provide a quick-make, quick-break non-teasing action. The contact mechanism must be such that the breaker will trip open even if the handle is held or locked in the ON position.
- (c) Calibration. Rating and performance of these breakers must be based on calibration at an ambient temperature of 40° C. (104°F.).

- (d) Rated Current. Each breaker must be capable of carrying 100% rated current continuously in its calibrated ambient temperature without tripping and without exceeding the temperature limits specified in the U. L. Standards.
- (e) Contacts. The contacts must be made of a non-welding silver alloy or equivalent, subject to approval.
- (f) Internal Parts. All internal parts of these circuit breakers must be corrosion resistant material.
- (g) Terminals. Solderless, pressure type terminals of copper construction must be provided for both line and load connections.
- (h) Handle Indication. The handle must indicate clearly whether the circuit breaker is on the ON, OFF, or TRIPPED position.
- (i) Mounting. Breakers furnished under this specification must have drilled and counterbored holes for front mounting which must conform to spacings shown on Department of Streets and Sanitation Drawings numbered 883, 884, 886, and 887.
- (j) Test Requirements. These breakers must be capable of meeting the following sequence of test requirements as specified in the U. L. Standards.
 - 1. Endurance test.
 - 2. Calibration test at 200% and 125% of rated current.
 - 3. Short circuit tests
 - 4. Calibration test at 500% rated current.
 - 5. Dielectric strength test.

WARRANTY

- 6. Circuit breakers furnished under this specification must be warranted by the manufacturer against defects in materials or workmanship for a period of one year after installation. During this period, should a failure occur, repair or replacement must be made without cost to the City.

CABLE: SERVICE ENTRANCE, THREE INSULATED CONDUCTORS IN ONE OVERALL JACKET, 600 VOLT

SUBJECT

- 1. This specification states the requirements for a three conductor (two power conductors and one neutral conductor) Ethylene Propylene Rubber (EPR) insulated, chlorosulfonated polyethylene (CSPE) or polyvinyl chloride (PVC) jacketed cable for installation on Commonwealth Edison service poles for the purpose of providing secondary power feeds from Commonwealth Edison to a City disconnect mounted on the pole for street lighting or traffic signal circuits.

GENERAL

2. (a) Specifications. The cable must conform in detail to the requirements herein stated, and to the applicable portions of the specifications and methods of test of the following agencies:
- (1) ICEA Specification S-95-658
 - (2) IEEE Standard 383
 - (3) ASTM Standard E-662-79
 - (4) ASTM Standard D-470-81
 - (5) U.L. 44
 - (6) U.L. 854
- (b) Acceptance. Cable not conforming to this specification will not be accepted.
- (c) Sample. A three (3) foot sample of the cable intended to be provided under this contract must be submitted to the Engineer of Electricity within fifteen (15) business days after receipt of such a request from the Chief Procurement Officer.
- (d) Warranty. The manufacturer must warranty the cable to be first class material throughout. If the cable is installed within one year of the date of shipment, the manufacturer must replace any cable failing during normal and proper use within two years of installation. The cable length to be replaced will be the entire unspliced length where the fault has been located. The Commissioner will be the sole judge in determining if a cable has failed and should be replaced. All replacements under this warranty must be made free of charge F.O.B. delivery point of the original contract

CABLE

3. (a) Construction. The cable must consist of three (3) conductors separately insulated and color coded. Suitable fillers must be used to produce essentially a round cross section in the completed cable. The insulated conductors must be cabled with a suitable left hand lay in conformance with the latest revision of ICEA S-95-658. A binder tape must be used over the cabled conductor assembly and a jacket applied overall.
- (b) Sealing. The ends of each length of cable must be sealed against the entrance of moisture.
- (c) Marking. The color of the neutral conductor must be white; that of the phase conductors must be black and red, respectively. The jacket must be black.
- (d) Each conductor must consist of a round copper wire with a tight fitting, free stripping, concentric layer of Ethylene Propylene insulation. The cable must be rated for continuous duty at 90°C operating temperature, wet or dry, 130°C emergency overload temperature and 250°C short circuit temperature.

CONDUCTOR

4. (a) Material. The conductor must either be soft or annealed round copper wire, tin

coated.

- (b) Specifications. The conductor must meet the requirements of ASTM B3, and B8 for stranded Class B copper.
- (c) Size. The conductor size must be as stated in the proposal or on the plans.

INSULATION

- 5. (a) Type. The insulation must be Ethylene Propylene compound meeting the physical and electrical requirements specified herein.
- (b) Thickness. The insulation must be circular in cross-section, concentric to the conductor, and must have an average thickness not less than 30 mils (.030") for #14 AWG, 55 mils (.055") for #4 AWG, 65 mils (.065") for #2 AWG, 80 mils (.080") for #1/0 AWG, 80 mils (.080") for #2/0 AWG ,and a spot thickness not less than ninety percent (90%) of the average thickness.
- (c) Initial Physical Requirements:
 - (1) Tensile Strength, min., psi. 1200
 - (2) Elongation at Rupture, min. % 250
- (d) Air Oven Exposure Test. After conditioning in an air oven at $121 \pm 1^{\circ}\text{C}$ for 168 hours using methods of test described in ASTM-D 573:
 - (1) Tensile strength, min% of unaged value 75
 - (2) Elongation, min % of unaged value at rupture 75
- (e) Mechanical Water Absorption:
 - (1) Gravimetric Method: After 168 hours in water at $70 \pm 1^{\circ}\text{C}$:
 - Water absorption, maximum
(Mg. per sq. in) 5.0
- (f) Cold Bend Test Requirements. The completed cable must pass the "Cold-Bend, Long-Time Voltage Test on Short Specimens" of ASTM D-470 except that the test temperature must be minus (-) 25°C .
- (g) Electrical Requirements.
 - (1) Voltage Test. The completed cable must meet an A.C. and D.C. voltage test in accordance with ASTM- D-470 and D-2655.
 - (2) Insulation Resistance. The completed cable must have an insulation resistance constant of not less than 20,000 when tested in accordance with methods shown in ASTM D-470.

JACKET

6. (a) Type. The jacket must be either a chlorosulfonated polyethylene (CSPE) or a polyvinylchloride (PVC) compound meeting the physical and electrical requirements specified herein. CSPE must meet the environmental requirements of CFR Title 40, Part 261 for leachable lead content.
- (b) Thickness. The jacket must be circular in cross-section, concentric with the insulation, must have an average thickness not less than 45 mils (.045") for #14 AWG, 80 mils (.080") for #2 and #4 AWG, and not less than 95 mils (.095") for #1/0 and #2/0 AWG, and a spot thickness not less than ninety percent (90%) of the average thickness.
- (c) Initial Physical Requirements:
- (1) Tensile strength minimum PSI..... 1800
 - (2) Elongation at rupture, minimum percent 300
- (d) Air Oven Exposure Test. After conditioning in an air oven at $121 \pm 1^\circ\text{C}$ for 168 hours:
- (1) Tensile strength, minimum percent of unaged value 75
 - (2) Elongation at rupture, minimum percent of unaged value 60
- (e) Mechanical Water Absorption. After 168 hours at $70 \pm 1^\circ\text{C}$:
- (1) Milligrams per square inch, maximum 20

TESTING

7. (a) General. Tests must be performed on insulation, jacket and completed cables in accordance with the applicable standards as listed in these specifications. Included in these tests will be a 70,000 BTU per hour flame test in accordance with IEEE 383. Where standards are at variance with each other or with other portions of this specification, the most stringent requirements, as determined by an engineer from the Bureau of Electricity, will apply. All tests must be conducted on cable produced for this order.
- (b) Number of Tests. Insulation and jacket tests must be conducted on samples taken every 5,000 feet or fraction thereof of each conductor size. In no case must less than two (2) samples be taken. Approximately five percent (5%) of the cable must be tested. Where the cable fails to conform to any of the tests specified herein, samples must be taken from each reel and must successfully conform to all tests specified herein. Reels from which samples fail to conform, will be rejected.
- (c) Witness Tests. If requested by the City, an engineer from the Bureau of Electricity must be present for testing. The contractor must include in his bid, the cost of travel, food and lodging for one (1) engineer. Travel for 150 miles or greater must utilize a major airline. Lodging accommodations must be equal to those provided at a Holiday Inn. The engineer must be given ten (10) working days notice of all travel arrangements.

- (d) Test Reports. No cable may be shipped until certified copies of all factory tests have been reviewed and approved by the engineer.

PACKAGING

8. (a) Cable Marking. The cable must be identified by a permanently inscribed legend in white lettering as follows:

3/C - No. (conductor size)AWG-600V-90°C-EPR/CSPE or EPR/PVC-manufacturers name- month-year of manufacture

The legend must be repeated at approximately eighteen (18) inch intervals on the outside surface of the cable parallel to the longitudinal axis of the conductor.

- (b) Reels. The completed cable must be delivered on sound substantial, non-returnable reels. Both ends of each length of cable must be properly sealed against the entrance of moisture and other foreign matter by the use of clamp-on cable caps. The ends must be securely fastened so as not to become loose in transit. Before shipment, all reels must be wrapped with cardboard or other approved wrapping.
- (c) Footage. Each reel must contain 1,000 foot of cable for either #4 AWG or #2 AWG and 500 feet of cable for #1/0 AWG or #2/0 AWG. A tolerance limit of plus or minus ten percent ($\pm 10\%$) must be adhered to.
- (d) Reel Marking. A metal tag must be securely attached to each reel indicating the reel number, contract number, date of shipment, gross and tare weights, description of the cable and the total footage. Directions for unrolling the cable must be placed on the reel with an approved permanent marking material such as oil-based paint or a securely attached metal tag.

TABLE 1 - THREE CONDUCTOR SERVICE ENTRANCE CABLE

Size (AWG)	Overall Diameter (mils)	No. Of Strands	Test Volts (KV)	Footage per Reel	Insulation (mils)	Jacket (mils)
4	950	7	4.5	1000	55	80
2	1100	7	4.5	1000	65	80
1/0	1400	19	5.5	500	80	95
2/0	1800	19	5.5	500	80	95

TRAFFIC SIGNAL CONTROLLER AND CABINET LOCAL AND MASTER TYPES

1. GENERAL REQUIREMENTS
 - 1.1 This specification details the requirements for traffic signal control equipment for use in the City of Chicago.
 - 1.2 Within fifteen (15) business days from receipt of notice, the contractor must provide a sample to the General Superintendent of Electrical Operations, Bureau of Electricity, 2451 South Ashland Avenue, Chicago, Illinois 60608. The sample must consist of the controller, cabinet, load switches, conflict monitor and all appurtenant wiring and equipment completely assembled as a working unit. This sample must be regarded as a finished production sample and conformance or non-conformance of the bid to these specifications must be based on the sample submitted. No subsequent modifications to the production sample will be allowed. The sample must become the property of the City of Chicago with a suitable credit issued to this contract.
 - 1.3 All tests as outlined herein must be regarded as minimum requirements. The contractor must submit his testing procedure for approval prior to performing any testing functions. Upon successful completion of all testing, certified test reports must be submitted for each unit. Units not successfully passing these tests or lacking proper documentation will be rejected.
 - 1.4 Standards. Equipment furnished under this specification must meet the appropriate requirements of the following standards, as required within the body of this specification:
 - American Society for Testing and Materials (ASTM)
 - Manual on Uniform Traffic Control Devices (MUTCD)
 - National Electrical Manufacturers Association (NEMA)
 - Occupational Safety and Health Administration (OSHA)
 - Underwriters Laboratories (UL)
 - 1.5 Definitions. Where referenced in the specification, the following definitions will apply:
 - 1.5.1 Approval. Approval will mean approval in writing by the Commissioner of Streets and Sanitation, or his duly authorized representative.
2. MATERIALS AND EQUIPMENT REQUIREMENTS
 - 2.1 CONTROLLER
 - 2.1.1 Power Source. The controller must operate on 120 volt, 60 cycle, single phase, alternating current.
 - 2.1.2 Packing. Each controller, with all its component parts, must be suitably packed in a single container in such a manner as to prevent damage to the contents in shipment and handling.

- 2.1.3 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 Bureau of Electricity for approval prior to the first shipment of controllers. All information, including photos and schematics, must reference to the controller being furnished on this contract and must be a high quality, completely legible reproduction. Upon approval, one complete set of data must be furnished with each controller.
- 2.1.4 Warranty. The manufacturer must warranty the performance and construction of these traffic signal controllers to meet the requirements of this specification, and must warranty all parts, components, and appurtenances against defects in design, material, and workmanship for a period of one (1) year after installation on moving parts, and for a period of five (5) years after installation on solid state devices. In the event of defects or failures during these periods, the manufacturer must repair and/or replace all defective or failed parts or appurtenances at no expense to the City within sixty (60) days from the date of shipment by the City.
- 2.1.5 Pre Shipment Testing. The manufacturer of the controller must perform at his manufacturing facilities a one hundred (100) hour burn-in test on every controller, conflict monitor unit, and appurtenant devices. This test period must be certified by the manufacturer with supportive documentation and must include the device serial number, dates and times of test periods, and results. Any failed, or nonconforming components must be replaced at this time. The 72 hour function test described in this specification, must be performed on each complete controller system. After each of the components has passed the burn-in test, they may be used in the assembly of the complete controller unit. Each completed unit must be subjected to the 72 hour function test as described in this specification. Should the controller fail to complete this test for any reason, the failed portion(s) of the unit must be replaced and the test repeated in its entirety. Certification of these tests must be attached to the outside of the shipping container. Any containers without this attached certification will be returned to the manufacturer at his sole expense. This certification is in addition to any other documentation and/or testing required by these specifications.
- 2.1.6 Manufacturer. The manufacturer of these controllers must demonstrate a knowledge of past production, or have been actively engaged in the sale and/or service of traffic signal controllers herein described, as demonstrated by a submitted list of comparable projects.
- 2.2 CONTROLLER TIMING
- 2.2.1 Controller timing must be accomplished with solid state digital timing referenced to a 60 Hertz power source.
- 2.2.2 The time cycle must remain constant and accurate within a voltage range of 95 to 135 VAC, and within a temperature range of minus(-) 30 degrees F. to plus (+) 165 degrees F., (-34 degrees C. to 74 degrees C.), without the use of heater elements or cooling means.
- 2.2.3 The cycle length must be capable of operating up to 255 seconds.

- 2.2.4 The controller must provide consecutive divisions of the time cycle hereinafter termed "intervals", during which combinations of signal indications do not change.
- 2.2.5 The controller must provide a minimum of 24 consecutive intervals.
- 2.2.6 Interval set times must be provided in both one-tenth (1/10) second steps and in one (1) second steps.
- 2.2.7 Offsets must be set in one (1) second steps.
- 2.2.8 Separate time settings must be available for each of the eight (8) cycle lengths, each of the five (5) offsets per cycle, and each of the twenty-four (24), or more, intervals per cycle. Multiple splits (up to four) within an interval must be provided.
- 2.2.9 The front panel of the controller must contain a display which must show the interval number, interval time, and offset for any dial as well as the currently active dial, depending upon the keyboard selection.
- 2.2.10 All timing entries must be made from a keyboard mounted on the controller front panel. It must be arranged such that a security access code is required before timing entries can be initiated. Two (2) security access by-pass codes must also be provided, one of which will initiate and the other negate this requirement.
- 2.2.11 Offset Correction. The controller must be capable of offset correction by both the dwell and short way methods. When the dwell method is used, the controller must be capable of a dwell time of up to one-half of the cycle length. Dwell time must be programmable. When the short way method is used, it must be possible to exclude intervals from timing variation.
- 2.2.12 Manual Operation. Operation of the controller by manual control must provide the same sequence of outputs as the current cycle, split, and signal plan called for by the interconnect or T.B.C. with no momentary undesirable indications appearing. It must also be possible to guarantee that certain user defined intervals must time out as normal before advancing to the next interval.
- 2.2.13 Housing. The controller must be enclosed in a rigid, dust and moisture resistant housing with front panel indicator to show which cycle, offset and interval are in effect. The timing of each interval, cycle and offset which is in, or not in, effect must be available for viewing by the use of front panel switches. Individual plug-in circuit boards and "mother" boards must be of moisture resistant design and construction.
- 2.2.14 Replacement. The controller must be capable of being replaced with an identical unit by the use of a standard M.S. type connector.
- 2.2.15 Marking. The circuit reference designation for each component on each printed circuit board must be clearly marked immediately adjacent to the component. Each board must have a unique serial number for identification purposes.
- 2.3 SIGNAL CIRCUIT SWITCHING
- 2.3.1 Interval Programming. Timer units must be supplied with either EEPROM or non-

volatile RAM signal drive circuit programming means to allow for the arrangement and rearrangement of signal output interval sequences to energize, or de-energize, any signal circuit during any interval. This program must provide separate, distinct access codes for timing and for sequence.

- 2.3.2 Outputs. All signal circuit outputs must be capable of reliably switching from five (5) to twenty-four (24) VDC with a steady current of three (3) to ten (10) ma.
- 2.3.3 Output Circuits. The controller must be capable of forty-eight (48) user defined and individually programmed signal outputs.
- 2.3.4 Preemption. The controller must be capable of a minimum of six (6) preemption sequences utilizing separate, or a combination of separate and existing, output sequencing. It must also be capable of defining priority of Preemption inputs as either High or Low.
- 2.3.5 Actuation. The controller must be capable of responding to a minimum of sixteen (16) actuation inputs. Responses must service user defined intervals in a user defined sequence.
- 2.3.6 Signal Plans. The controller must be capable of eight (8) separate user defined signal plans.
- 2.3.7 M.U.T.C.D. Flash. The controller must be capable of M.U.T.C.D. flash without external devices.
- 2.3.8 Transfer Intervals. The controller's Split, Signal Plan, Start Up, Restart, Enter Flash and Exit Flash must be user defined.

2.4 TIME BASED COORDINATORS

- 2.4.1 Isolated Intersection (TIME BASE COORDINATOR). Each controller must be furnished with an internal eight (8) circuit, solid state, "time of day", "day of week", timing device which allows for synchronization of the system without external interconnection. This function must be keyboard programmable to one (1) second resolution. Programming must be provided for controlling operating modes, such as SET CLOCK, RUN, EXAMINE/PROGRAM, etc. Indicators must be provided on the front panel to show day of week, time in hours and minutes, and output circuit activation. This function must meet the requirements:
- 2.4.2 System Synchronization. System synchronization must be based on an "Absolute Zero" offset reference. This method provides for a "continuous" reference, of the system to a real time base as established by the Bureau of Electricity and strictly prohibits "once a day" synchronization of the System. After a power outage, the system will automatically reference each cycle counter back to its last reference point. The system must be capable of automatically referencing back a minimum of 100 hours without manual reset.
- 2.4.3 Dials. This function must provide three (3) outputs for selection of one (1) of eight (8) or more dials. Each dial must offer a minimum of five (5) offsets, four (4) splits and eight (8) signal plans.

- 2.4.4 Stability of Pulse. The stability of the synchronous pulse output must be that of the 60HZ power line when it is within 95-135 VAC. When line power is out of this range or power is removed, the device must maintain synchronization and program functions and not drift more than $\pm 0.005\%$ for a minimum of ten (10) hours.
- 2.4.5 Outputs. DC outputs: All DC outputs must be capable of reliably switching from five (5) to twenty-four (24) VDC with a steady current of three (3) to ten (10) ma.
- 2.4.6 Visual Program Verification. When a program instruction is being entered, each element of the program must be visible on the display for verification before the instruction is entered. Provision must be made for correcting any instruction before it is entered. The unit must provide for alteration of any single instruction of an entered program without disturbing any other instruction in that program.
- 2.5 CONFLICT MONITOR
 - 2.5.1 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.
 - 2.5.5 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.
 - 2.5.3 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.
 - 2.5.4 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.
 - 2.5.6 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.
 - 2.5.7 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.
 - 2.5.8 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.
- 2.6 CONFLICT MONITOR ASSIGNMENTS
 - 2.6.1 Conflict monitor channels must be assigned as follows:

(Red, Yellow, Green channels)
Channel 1 Vehicle - Load Switch 1
Channel 2 Vehicle - Load Switch 2
Channel 3 Vehicle - Load Switch 3
Channel 4 Vehicle - Load Switch 4
Channel 5 Vehicle - Load Switch 5
Channel 6 Vehicle - Load Switch 6
Channel 7 Vehicle - Load Switch 7
Channel 8 Vehicle - Load Switch 8
Channel 9 Vehicle - Load Switch 9
Channel 10 Vehicle - Load Switch 10
Channel 11 Vehicle - Load Switch 11
Channel 12 Vehicle - Load Switch 12

- 2.6.2 It must be possible for the user to change conflict assignments without unsoldering any connections.
- 2.6.3 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.
- 2.6.4 A terminal must be provided for the red enable feature.
- 2.6.5 A terminal must be provided for the hook up of any unused red channels to AC.
- 2.6.6 Controller monitoring must consist of; voltage monitor, 24 VDC I, 24 VDC II.
- 2.6.7 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.
- 2.7 CABINET
- 2.7.1. 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 M Type with nominal dimensions of 50" high by 30" wide by 17" deep for local controllers, and P Type with nominal dimensions of 55" high by 44" wide by 26" deep for master controllers. Manufacturer will be Erpel, Hennessy, Southern Manufacturing Company, or approved equals.
- 2.7.2 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.

- 2.7.3 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.
- 2.7.4 Shelf. The cabinet must contain a vertically adjustable shelf large enough to accept the solid state controller and all other shelf mounted devices.
- 2.7.5 Size. The exterior dimensions of the cabinets will be approximately fifty (50) inches high by thirty (30) inches wide by seventeen (17) inches deep for M Type cabinets, 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.
- 2.7.6 Finish. The exterior surfaces of the cabinet must be smooth. All drilled, tapped, or punched holes on the outer surface must be filled with liquid metal and ground smooth, and slotted screw heads must be ground smooth flush with surface. Bolts extending through cabinet wall must be round head, carriage, square shoulder type and fastened on the inside of the cabinet with an Esna nut and necessary gaskets to insure the weatherproofing integrity of the cabinet. The finished cabinet must be thoroughly degreased in a wash process and dried in a heated chamber. A thermosetting, ultra violet resistant, polyester powder coat must be electrostatically applied to all cleaned and treated surfaces and cured to a hard, mar resistant finish in a heated chamber at a temperature recommended by the powder coat paint manufacturer. Exterior color must conform to Federal Standard 595, and either be City of Chicago green color No. 14110 or gloss black color. Exterior color must be as defined in the PROPOSAL or Contract Plans, and color samples must be submitted for approval prior to acceptance of cabinet. Cabinet interior must be glossy white and may be either baked enamel or thermosetting, polyester powder coat. For either process, the interior must be prepared as described above. If the baked enamel finish is used, it must be preceded by one (1) coat of primer.

2.8 POWER SUPPLY

- 2.8.1 A sixty (60) ampere main breaker must be inserted in series with the line.
- 2.8.2 An unfused terminal bus must be provided for ground side of the power supply and signal conductor commons.
- 2.8.3 Individual circuit breakers must be supplied for: (a) AC+ lights, 50 amperes; (b) AC+ control, 10 amperes; (c) duplex outlet supply, 15 amperes.
- 2.8.4 The incoming line must contain lightning protection devices consisting of, but not limited to, a metal oxide varistor and gas type arrester. The gas type arrester must be on the line side of the radio interference filter.
- 2.8.5 Contactor: A sixty (60) ampere Magnacraft, or approved equivalent, normally open, "A" type mercury contactor must be supplied for opening and closing the AC supply to the signal bus. This contactor must be mounted in such a manner on the power supply panel that accidental contact does not produce a safety hazard.
- 2.8.6 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.
- 2.8.7 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.
- 2.8.8 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.

2.9 LOAD SWITCH BAY

- 2.9.1 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.
- 2.9.2 Wiring. Panel wiring must be neatly laced and properly terminated individual conductors. They must be insulated and properly sized for their application.
- 2.9.3 Load Circuits. Each load circuit must be capable of carrying fifteen (15) amperes continuously at a temperature of 74 degrees C (165 degrees F).
- 2.9.4 Bus Feeds. Bus feeds must be capable of carrying fifty (50) amperes continuously at a temperature of 74 degrees C. (165 degrees F).
- 2.9.5 Equipment. In addition to the items listed in 2(a), the wiring panel must include, but not be limited to, the following:
- (1) Ten (10) ampere fuses with barrier type fuse holders must be installed

between the load switch signal output circuits and field terminals for signal light conductors. Each terminal must be the barrier type with sufficiently long screws to accept four (4) #12 AWG solid conductors. The terminals must be located at least two inches (2") above the bottom of the cabinet.

- (2) Switching Device. The signal load switching device must be a three (3) circuit, solid state, jack mounted load switch which meets the N.E.M.A. Publication TS-1, Part 5 requirements. Each load switch must be rated for a minimum fifteen (15) ampere continuous resistive load and must mate with an S-2412-SB panel socket. A minimum of twelve (12) and a maximum of sixteen (16) load switches to be provided with each cabinet, as defined in the PROPOSAL or Contract Plans.
- (3) User Programmable Interface. Two (2) sets of terminal blocks must be provided between the machine logic output and the input side of the load switches. By terminating all machine logic output on one set of terminals and all load switch input to the other set, an interface is thus created by which the machine logic can be readily connected to any of the load switches by means of a jumper wire. The two (2) sets of terminal blocks must be conveniently located in close proximity to each other and must be arranged such that, initially, each function will be factory wired directly from one set of terminals to the other without the need to criss-cross wires between blocks.
- (4) Number of Signal Circuits:
 - a. Twelve (12) load bay panel. Each panel must be equipped with twelve (12) load switch jacks for a minimum of thirty-six (36) signal circuits.
 - b. 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.
 - c. 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.

2.9.6 Identification. All field terminals must be suitably identified, subject to approval.

2.10 FLASHING FEATURE

2.10.1 General. The flasher must be a solid state device, with no contact points or moving parts, producing between 50 and 60 flashes per minute with a 40 to 50 percent duty cycle. The flasher mechanism must be mounted on a type P-406-SB plug which will mate with an S-406-SB socket on the controller panel. The flasher must utilize zero-point switching, with turn-on at the zero voltage point (± 5 degrees) of the power line sinusoid.

2.10.2 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.

- 2.10.3 Flasher Circuits. Flashers must provide two (2) output circuits to permit alternate flashing of signal phases and must be capable of carrying a minimum of twenty (20) amperes per circuit at 120 volts. The flasher must operate continuously so that flashing power will be available at the field terminal marked "FL". The flasher wiring must divide the loads imposed on the two (2) circuit flasher alternately on each phase.
- 2.10.4 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.
- 2.11 POLICE PANEL
 - 2.11.1 Auto-Off Flash Switch. Each controller must be provided with an auto-off-flash switch. In the "AUTO" position the signals will be on and the controller timing unit will run normally. In the "OFF" position the signals will be OFF and the controller timing unit will continue to run. In the "FLASH" position the signals will flash and the controller timing unit will continue to run. The auto-off flash switch must be located on the side of the police switch panel that faces outward when the police door is open.
 - 2.11.2 Auto-Hand Switch. Each controller will have an auto-hand switch on the back side of the police switch panel. This switch must be so arranged that the switch can be physically rotated 180 degrees to provide usage after opening the police panel door. It must be so mounted that the act of rotation does not affect the police switch panel. Switch terminals must not be exposed on either position.
 - 2.11.3 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.
 - 2.11.4 Space Requirement. Adequate room must be provided in the police panel section to store the manual switch and retractable cord.
- 2.12 MANUAL OPERATION
 - 2.12.1 General. The auto-hand switch must provide a means of manually timing the signals by use of a separate, momentary contact, hand switch. Operation of the timer by manual control must provide the same color sequence as an automatic operation with no momentary undesirable indications appearing. Manual control must be possible with the door of the cabinet closed. The hand switch required for manual control must only be supplied when specified in the PROPOSAL. It must be of an approved weatherproof construction with a six (6) foot, retractable, flexible, extension cord to allow connection to the appropriate terminals on the panel of the controller. It must not be possible to manually step through a vehicle clearance interval.
- 2.13 RELAYS
 - 2.13.1 Transfer Relays. Six (6) 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.

2.13.2 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.

2.13.3 Dust Cover. A suitable dust cover must be furnished for each relay.

2.13.4 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).

2.14 COMMUNICATIONS INTERFACE PANEL

2.14.1 Where a communications interface has been specified in the PROPOSAL or contract plans to allow a controller to function as a Master or Secondary controller, then one of the specified options must be provided:

(1) Fiber Optic Communications Interfaces must meet the following requirements:

- a. General. The fiber optic communications components must consist of, but not be limited to, an internal fiber optic modem within the controller, a fiber optic patch panel to interface the modem to field fiber optic cables, and fiber optic jumpers between the modem and patch panel.
- b. The modem in Master controllers must either be a multi-directional "star" type or a bi-directional type, as specified in the PROPOSAL or contract plans. The modem in Secondary (i.e., local) controllers must be bi-directional type. All modems must be Electronic Industries Association (EIA) compatible for RS-232 data communications via fiber optic link. Modems must be multi-mode, operate at 850nm wavelength, and provide full-duplex, frequency modulated, asynchronous transmission at data rates of up to 38.4 kbps.
- c. The fiber optic patch panel must consist of a 14" long by 5-3/4" wide by 3-1/4" high rack constructed in accordance with City of Chicago BOE Drawing #909. The rack must be designed to mount on the controller cabinet rails. "ST" type terminals, suitably labeled, must be provided for the connection of field fibers and Modem.
- d. The fiber optic jumpers (i.e., optical patch cords) must consist of a single multi-mode fiber in 900 micron orange jacket, with "ST" type connectors factory installed on each end. The jumpers must be 3' long in Secondary (i.e., local) controller cabinets and 6' long in Master controller cabinets. The jumpers must be connected to the patch panel and supported in such a manner that the minimum bending radius is ten (10) times the diameter of

the cable, and the cables exert no strain on the connectors. Each jumper must have a minimum tensile strength of 50 lbs.

- (2) Copper Wire Interconnect Panels (Seven Wire, VAC) must meet the following requirements:
 - a. General. The interconnect panel must serve to isolate interconnect VAC from the controller. The panel must consist of, but not be limited to, seven (7) relays. Each relay interconnect circuit must include an M.O.V. properly rated for protection against lightning and switching surges injurious to the controller and a barrier type 3AG fuse receptacle and fuse not to exceed five (5) amperes. Each panel must provide a seven (7) wire interface with the T.B.C. functions described below and must provide barrier type terminals suitably labeled for these functions.
 - b. The secondary interconnect panel must be wired in such a manner that an VAC input activates a relay sending an input from that relay to the controller. It must have a minimum of seven (7) relays for the following functions; Dial 2, Dial 3, Dial 4, Offset 1, Offset 2, Offset 3, M.U.T.C.D. flash.
 - c. The master interconnect panel must provide a means to establish outgoing VAC for a seven (7) wire interconnect system using eight (8) relays. The relays must have 24 VDC coils and be designated as, Dial 2, Dial 3, Dial 4, Sync, Offset 1, Offset 2, Offset 3, M.U.T.C.D. flash. The sync relay must be wired in such a manner that it provides the offset pulse to the contacts of the three (3) Offset relays.
 - d. Each relay must be a double pole type, with one pole designated as field interconnect output, and the other designated as controller input. Relay coils must be rated for continuous duty. Relay contacts must be rated for a continuous fifteen (15) AMP resistive load.
 - e. A terminal strip must be mounted on the top of the master interconnect panel for controller interface.
 - f. The master panel must interface with the T.B.C. terminals as described above.
 - g. Each output must be fused as outlined above.

2.15 WIRING

- 2.15.1 General. All electrical conductors must be stranded copper, with a minimum of nineteen (19) strands per conductor, and a concentrically applied 90 degree 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.

2.15.2 All VAC connections to load switches, flasher, and flash transfer relays must be soldered. All VAC connections on back of terminals must be soldered.

2.15.3 All VDC connections on back of terminals, and load switches must be soldered or connected with pre-approved terminations. All VDC connections to load switches are to be soldered or connected in a manner pre-approved by the City of Chicago's Bureau of Electricity.

3. TESTING REQUIREMENTS

3.1 General. The following test requirements must utilize, but not be limited to, the following outline:

3.1.1 N.E.M.A. Environmental Test. One controller, the submitted sample unless approved otherwise, must be tested, at the manufacturer's expense, in accordance with Part 2 of NEMA Standards Publication TS1-1983. All of the tests listed must be performed with all data properly recorded and certified. If the manufacturer changes the design, fabrication or components of a previously tested and approved controller, then a sample of the controller containing the new design, fabrication or components must be retested at the manufacturer's expense. Any N.E.M.A. environmental test references to minimum recall must include but not be limited to: All thirty-six (36) output circuits must be "burned in" a test prom 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 twenty-four (24) intervals must be programmed with a minimum of two (2) seconds per interval. A copy of the test prom must be approved by the City of Chicago, Bureau of Electricity prior to testing.

3.1.2 Functional "Burn In" Testing. The "burn in" requirement must include a test that uses all thirty-six (36) output circuits in "solid" burn as well as 1 pps and 5 pps for each circuit. All twenty-four (24) intervals must be programmed with a minimum of two (2) seconds per interval. The test program or PROM in a sequence to simulate the normal functioning of the entire controller-cabinet assembly. A copy of the test program or PROM must be approved by the City of Chicago, Bureau of Electricity prior to testing.

3.1.3 Performance Testing Requirements. In addition to the NEMA environmental test and the "burn-in" requirements stated above, satisfactory performance of the traffic signal cabinet and its equipment must be demonstrated prior to shipment from the factory. The manufacturer must submit five (5) copies of his proposed "Test Procedure Document" for approval with the sample requested above. The test procedure must consist of two (2) sections; Physical inspection and functional testing. If the test procedure is judged by the Commissioner or his duly authorized representative to be incomplete, inadequate or otherwise deficient, the contractor must revise and resubmit his "test procedure document" until it is approved. No contract can be awarded until the "test procedure document" has been approved.

3.1.4 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.

- 3.1.5 Testing, Certification and Observation. Each traffic signal controller ordered must be tested in accordance with the approved "Test Procedure" document. The City's representative(s) must observe the manufacturer's testing in progress. The City must be notified at least thirty (30) calendar days prior to testing, and no testing will be initiated without the presence of its representative(s). The representative(s) may observe all, or a portion, of the tests, as he (they) may deem necessary. Certification documents that the traffic signal controller has been tested in accordance with the Test Procedures documents, and the results of these tests, must be signed by the individual(s) performing the tests and their immediate engineering supervisor. Two (2) copies of each certification document must be delivered with each production traffic signal controller. The contractor must include in his bid the cost of travel, food and lodging for two (2) engineers. Travel for 150 miles or greater must utilize a major airline. Lodging accommodations must be equal to those provided at a Holiday Inn.
- 3.1.6 Physical Inspection. The "physical inspection" portion of the test procedure document must require the manufacturer to perform a physical inspection of workmanship and specification compliance for each traffic signal controller assembly. The inspection must be done using a detailed check list defining items to be inspected and criteria for acceptance. The inspection must include, but not be limited to, the following items:
- (1) Hardware installation.
 - (2) Assembly mounting.
 - (3) Dimensions.
 - (4) Presence of specified devices and materials.
 - (5) Presence of required documents.
 - (6) Labeling and required serial numbers.
 - (7) Wiring including routing, covering, gauge, length, and soldering of terminations.
 - (8) Arrangement of equipment for safety and ease of calibration reprogramming troubleshooting and maintenance.
 - (9) Condition of cabinet body and finish.
 - (10) Condition and installation of doors, panels, gaskets and ventilation.
 - (11) High voltage test of insulation resistance to ground, with wires installed in cabinet and equipment disconnected.
- 3.1.7 Functional Testing. The "functional testing" portion of the Test Procedure must require the manufacturer to perform a complete room-temperature functional test of each complete traffic signal controller assembly for a minimum of seventy-two (72) hours. This test must be designed to concurrently check integrated hardware systems e.g., from simulated input to load switch output including conflict monitor and time base coordinator. All interface/controller interconnections must be tested. All load switch and interconnect relay positions must be tested, regardless of the number of load switches and interconnect relays being purchased. The functions tested must include, but not be limited to, the following:
- (1) Flash logic and operation (color, phases).
 - (2) Conflict monitor logic and operation.
 - (3) Police panel switch operation.
 - (4) Auxiliary panel switches (including fans).
 - (5) Interface panel.

- (6) Time switch operation.
- (7) Load switches (with a continuous ten (10) ampere load on each signal circuit).
- (8) Outputs.
- (9) Power interruptions of less than 500 ms.
- (10) Power interruptions of more than 1.0 sec.

ARTERIAL STREET LIGHTING CONTROLLER

SUBJECT

1. This specification states the requirements for an arterial street lighting controller and aluminum cabinet for use in controlling arterial street lighting circuits. The cabinet will be mounted to a housing, which will be affixed to a concrete foundation.

GENERAL

2. (a) Specifications. The controller must conform in detail to the requirements herein stated, to the Federal Standard cited by number, and to the Specifications and Methods of Test of the American Society for Testing and Materials, cited by ASTM Designation Number, in which the most recently published revision will govern. Cabinets must meet or exceed the requirements of a NEMA rating 3R and must be U.L. listed.
- (b) Acceptance. Controllers and cabinets not conforming to this specification will not be accepted.
- (c) Drawings. The drawings mentioned herein are drawings of the Department of Streets and Sanitation, Bureau of Electricity, and must be interpreted as part of these specifications cooperating to state necessary requirements.
- (d) Sample. One complete controller in cabinet of the manufacture intended to be furnished must be submitted upon request of the Chief Procurement Officer within fifteen (15) business days after receipt of such a request. The sample must be delivered to the attention of the Engineer of Electricity, Bureau of Electricity, 2451 South Ashland Avenue, Chicago, Illinois 60608.
- (e) Warranty. The manufacturer must warranty the controller and cabinet against flaws in material or workmanship for a period of two (2) years from the date of delivery. Any controller or cabinet developing flaws within this period must be replaced by the manufacturer, including shipment, at no cost to the City.

DESIGN

3. (a) Drawings. The control cabinet must conform in detail to requirements shown on Drawing 876 for a 100 Amp application and to Drawing 880 for a 200 Amp application.
- (b) Material. The cabinet and the door assembly must be constructed of 5052-H32 sheet aluminum alloy, with a minimum thickness of .125 inches. The base plate must be sheet aluminum of .250 inch thickness. All electrical components and wiring must be as shown on the appropriate drawings.
- (c) Dimensions. The overall outside dimensions of the 100 amp control cabinet must

be 36 inches in height by 20 inches in width by 15 inches in depth. The overall outside dimensions of the 200 amp control cabinet must be 41 inches in height by 25 inches in width by 16 inches in depth. Cabinets must have sloped tops to shed water.

CABINET REQUIREMENTS

4. (a) Cabinet. The cabinet must be sized as shown on either Drawing 876 or Drawing 880, depending on the controller amp rating. The cabinet door opening must be double flanged on all four (4) sides. A door restraint must be provided to prevent the door from moving in windy conditions.
- (b) Door. The door size must be a minimum of 80% of the front surface area. The door must be hinged on the right side when facing the cabinet. The door must have a gasket that meets the requirements found in U.L.508 Table 21.1. The gasket must form a weather-tight seal between the cabinet and the door. The door, when closed, must be flush with the cabinet.
- (c) Hinges. Hinges must be continuous and bolted to the cabinet and door with 1/4-20 stainless steel carriage bolts and nylock nuts. Hinges must be made of .093 inch thick aluminum. The hinge leaves must not be exposed externally when the door is closed. Only the hinge knuckles must be visible upon closing the door. The hinge pin must be .250 inch diameter stainless steel and must be capped top and bottom by weld to render it tamper-proof.
- (d) Latching. The latching mechanism must be a three-point draw roller type. The pushrods must be aluminum. The rollers must be nylon with a minimum diameter of .875 inches. The center catch must be .187 inch aluminum, minimum.
- (e) Handle. The handle must be stainless steel with a .750 inch diameter shank. The handle must have provision for a padlock. The lock must be keyed dead bolt #200725 or equivalent. Two (2) keys must be provided for each cabinet.
- (f) Ventilation. Louvered vents must be provided in the door. Louvers must satisfy the NEMA rod entry test for 3R enclosures. A removable filter must cover the louvers from inside the door. The filter must be held firmly in place with top and bottom brackets and a springloaded clamp. Exhaust air must be vented out between the top of the cabinet and the door. The exhaust area must be screened with openings of .12 inch by 1.0 inch.
- (g) Equipment Mounts. The cabinet must be equipped with two (2) adjustable AC channels on both side walls and on the back wall. The internal dimensions of the channels must be 1.075 inches high by .625 inches wide. All mounting hardware must be furnished.
- (h) Workmanship. All control cabinets must be free of flaws, and must have neat, smooth exterior surfaces. All holes must be accurately located and drilled. All welds must be neatly formed and free of cracks, blow holes, or other irregularities. All inside and outside edges must be free of burrs.
- (i) Painting. The cabinet, door and other parts must be treated by an iron phosphate

conversion technique. After which, all the parts must be baked dry. A polyester powder coat must then be applied. The inside of the cabinet and door must be white. The outside of the cabinet and door must be green meeting No. 14110 of Federal standard Number 595, or a gloss black, or another color as specified. A paint chip must be provided upon request.

PANEL

5. (a) The panel must be composed of phenolic plastic ½ inches in thickness, or an approved equal. It must be securely bolted to the cabinet using stainless steel hardware.
- (b) The panel will be sized, cut, and drilled as shown on the appropriate standard drawing. For a 100 amp – 2 pole controller, the panel must comply with Drawing 883. For a 200 amp – 2 pole controller, the panel must comply with Drawing 884. For a 100 amp – 3 pole controller, the panel must comply with Drawing 887. For a 200 amp – 3 pole controller, the panel must comply with Drawing 886. If alternate components are proposed, the panels must be sized accordingly.

ELECTRICAL COMPONENTS

6. (a) All components will be as indicated on the appropriate drawing, or will be approved equals. Circuit breakers must have thermal magnetic trips. Each breaker must be enclosed in a hard insulated housing. All breakers must be UL listed. The photo-cell relay, if required, must meet City specifications.
- (b) Wiring will be as indicated on the appropriate drawing. All wire will have stranded copper conductors, unless indicated otherwise. All wires must be insulated with an approved 125° Centigrade insulation.
- (c) For a 3-wire, 1-phase, 240 volt ComEd input, components and wiring will be as indicated on Standard Drawing 862 (for either 100 amp or 200 amp service). For a 2-wire, 240 volt ComEd input, components and wiring will be as indicated on Standard Drawing 863 (for 100 amp service only). For a 4-wire, 3-phase, 120/208 volt ComEd input, components and wiring will be as indicated on Standard Drawing 864 (for either 100 amp or 200 amp service).

INSPECTION

7. An inspector representing the City must have free access at all times while work on these control cabinets is being performed, to all portions of the manufacturer's works which concern their manufacture. The manufacturer must afford the inspector, without charge, all reasonable facilities to satisfy him that the cabinets are being furnished in accordance with this specification. The final inspection must be made at point of delivery. Any control cabinets rejected or defective must be removed and disposed of by the Contractor at his sole expense.

**LUMINAIRE: WITH INTEGRAL BALLAST FOR 400 WATT, HIGH PRESSURE SODIUM LAMP;
I.E.S. TYPE II/TYPE III DISTRIBUTION**

Subject.

1. This specification states the requirements for a street lighting luminaire, with integral ballast and electronic starter, to provide base down to horizontal burning of 50,000 lumen, 400 watt, Type LU400 high pressure sodium lamp.

General.

2. (a) Information Required. Each bidder must submit with his proposal the following information relative to the luminaires he proposes to furnish:
 1. Outline drawing.
 2. Complete description and weight.
 3. Candlepower distribution curve showing the light distribution in the 70° degree cone and in a vertical plane through the maximum beam.
 4. Isolux curves for the various socket positions.
 5. Utilization efficiency charts.
 6. Luminaire efficiency.
 7. Projected area in square feet.
 8. Manufacturer's name and catalogue designation of the luminaire.
 9. IES formatted photometric curve in electronic format.
- (b) Sample. One completely assembled luminaire of the manufacture intended to be furnished, must be submitted upon request of the Chief Procurement Officer within fifteen (15) business days of such request.
- (c) Assembly. Each luminaire must be delivered completely assembled, wired, and ready for installation; without the lamp and fuses. It must consist of aluminum housing, aluminum reflector, glass refractor, refractor holder, lamp holder assembly, terminal board-fuse block, ballast-door panel, ballast components, gaskets, slip fitter, and all necessary hardware.
- (d) 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 one (1) year after the luminaire has been placed in service. 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 reflecting surface, and discolorations or fogging of the refractor impairing the transmission of light. Any luminaire or part thereof, not performing as required, or developing defects within this period must be replaced by the manufacturer without expense to the City.

Construction.

3. (a) Weight and Area. The net weight of this luminaire with ballast must be not more than 60 pounds. The projected area must not exceed 3.1 square feet.
- (b) Housing. The housing must be a precision molded aluminum die casting. The wall

thickness must be substantial and adequate to withstand the strains likely to be imposed on the housing when installed and in service.

- (c) Slip Fitter. The slip fitter must be suitable for attachment over the end of a two (2) inch steel pipe with an approved means of clamping it firmly in place, and must provide a built-in pipe-stop. It may be integral with, or may be attached to, the housing. The slip fitter must be designed to permit adjustment of not less than three (3) degrees above and below the axis of the mounting bracket. The slip fitter must contain an approved shield around the pipe entrance to block entry of birds.
- (d) Lamp Holder Assembly. The lamp holder must be fully adjustable to accurately position the lamp. It must be a mogul, porcelain enclosed socket having lamp grips, and must be high quality commercial product. The socket support bracket must provide both horizontal and vertical adjustments to achieve a broad range of light distribution patterns. Each adjustment position must be clearly marked, and the socket must be positively secured in each position. The lamp holder and its bracket must be assembled in the optical system, in a manner which provides a completely sealed, moisture and dust tight optical system.
- (e) Reflector. The reflector must be made of aluminum and polished to a highly specular "Alzak process" finish with suitable means for attachment to the housing. It must be of such design as to give proper re-direction of the light striking it with minimum reflection through the outer bulb of the lamp and must distribute the reflected light uniformly over the refractor surface.
- (f) Refractor. The refractor must 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 reflection and refraction the light from the lamp to produce vertical and lateral light distribution patterns conforming substantially with both I.E.S. Type II and Type III light distributions. For diffusion of the light and good appearance, a pattern of continuous and adjoined flutes or configurations must be pressed on the outside surface. In the event the refractor can fit into its holder in two (2) positions, the refractor must be clearly embossed with the designations Δ street side Δ and Δ house side Δ to insure proper orientation.
- (g) Refractor Holder. The refractor holder must be hinged to the luminaire housing and must open approximately 90 degrees to allow servicing of lamp and reflector. The refractor must be securely held in the refractor holder. In the closed position the refractor holder must cause the refractor to seat against the reflector gasket. The refractor holder must permit simple removal and replacement of the refractor without the use of tools. The hinge must prevent the refractor holder from disengaging and dropping in case it should swing open.
- (h) Latch. An approved latch must be provided for latching the refractor holder to the housing. The latch must be located opposite a suitable hinge, and in conjunction with the hinge must compress the gasket between the reflector and refractor. The latch must be a firm-gripping, easy opening, single action, positive latching type requiring no tools.

- (i) Ballast Door-Panel. The ballast components must be completely assembled and mounted on a die-cast aluminum door-panel. The door-panel must be hinged to the luminaire housing, suitably latched and fastened at the closing end; and it must be rapidly and simply removable. The hinge and fastening devices must be captive parts which will not become disengaged from the door panel.
- (j) Gaskets. Wherever necessary, in order to make a completely dustproof optical assembly, gaskets of silicone rubber or other specifically approved material must be provided. The reflector gasket must fit around and over the flange of the reflector.
- (k) Hardware. All machine screws, locknuts, pins and set screws necessary to make a firm assembly, and for its secure attachment to the mast arm, must be furnished in place. All hardware must be of stainless steel, copper silicon alloy or other non-corrosive metal, and where necessary must be suitably plated to prevent electrolytic action by contact with aluminum.
- (l) Fiberglass Tubing. Two lengths of fiberglass tubing with silicone varnish coating meeting requirements of National Electrical Manufacturers' Association insulation classification HC-2, Size 2 (0.263" I.D.), must be provided to permit proper thermal insulation of conductors ("LINE" leads) within the luminaire. They must be sufficiently long to extend from the terminal block to a point 6 inches beyond the end of the slip fitter.
- (m) Terminal Board-Fuse Block. A terminal board of molded phenolic plastic of the barrier type must be mounted within the housing in a readily accessible location. It must provide all terminals needed to completely prewire all luminaire components. The terminal board must either incorporate a barrier isolated section with fuse clips to take two "small-dimension" (13/32" x 1 1/2") cartridge fuses, or a separate barrier protected fuse block must be provided therefor. The fuses are not required to be furnished with this luminaire. The fuse block must be wired to the appropriate terminals. The terminal board-fuse block must have plated copper or plated brass, clamp-type pressure terminals of an approved type for "line" connections, to accommodate wire sizes from #12 to #8 A.W.G. The terminals for connection of internal components must either be the screw-clamp or quick disconnect type.
- (n) Filter. The optical system must contain a charcoal "breathing" filter, of adequate size to provide effective filtering of particulate and gaseous contaminants.
- (o) Finish. The luminaire must have a baked on enamel finish. Surface texture and paint quality will be subject to approval. Color must be gloss black or gray Munsell No. 5BG 7.0/0.4 (designated A.S.A. No. 70) as specified in the order. A paint chip must be submitted as a sample upon request.

Ballast.

- 4. (a) General. The integral ballast must be a voltage tapped, high power factor, linear type, low loss reactor. It must be designed to furnish proper electrical characteristics for starting and operating a 400 watt high pressure sodium lamp at temperatures as low as minus 40°F. 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.

- (b) Lamp Operation. The ballast must provide positive lamp ignition at an input voltage of 191 volts. It must operate the lamp over a range of input voltage from 191 to 220 volts without damage to the ballast for the 208 volt tap connection and 220 to 254 volts for the 240 volt tap connection. It must provide lamp operation within lamp specifications for rated lamp life at input voltage between 198 volts and 218 volts for the 208 volt tap connection and between 228 volts and 252 volts for the 240 volt tap connection.
- (c) Rating. The ballast must have properly coded wire leads for taps at rated input voltage of either 208 or 240 volts at 60 cycles, which must drive a nominal 100 volt lamp at 400 watts. The design range of input voltage for this ballast must be from +6% to -8% of the nominal voltage.
- (d) Lamp Current. The ballast must supply approximately 4.7 amperes to a 400 watt, 100 volt high pressure sodium lamp during operation, and not more than 7.0 amperes at starting.
- (e) Power Factor. The power factor of the ballast over the design range of input voltages specified above must not be less than 90%.
- (f) Line Current. With nominal input voltage applied, the input current under starting, short circuit or open circuit condition, must not exceed 4.7 amperes rms.
- (g) Lamp Wattage. The ballast must deliver 400 watts to a nominal 100 volt lamp when operating at the nominal input voltage. Wattage input to the nominal lamp must not vary more than a total of 37% over the input voltage design range of 191 volts to 254 volts with the supply connected to the proper ballast tap.
- (h) Ballast Loss. Wattage loss of the ballast must not exceed 43 watts when delivering 400 watts to a nominal lamp at the nominal input voltage of 208 or 240 volts.
- (i) Electronic Starter. The starter component must be comprised of solid state devices capable of withstanding ambient temperatures of 100°C. The starter must provide timed pulsing with sufficient follow-thru current to completely ionize and start all lamps. Minimum amplitude of the pulse must be 2,500 volts, with a width of one (1) microsecond at 2,250 volts, and must be applied within 20 electrical degrees of the peak of the open circuit voltage wave with a repetition rate of once each half cycle of the 60 cycle wave. The lamp peak pulse current must be a minimum of 0.5 amps. Proper ignition must be provided over a range of input voltage from 191 to 254 volts. The starter component must be field replaceable and completely interchangeable with no adjustment necessary for proper operation. The starter component must have push-on type electrical terminations which must provide good electrical and mechanical integrity with ease of replacement. The starter circuit board must be treated in an approved manner to provide a water and contaminant resistant coating.
- (j) Crest Factor. Maximum crest factor must be no greater than 1.65 over the input voltage range of 191 to 254 volts for a nominal vertical burning lamp.

- (k) Mounting. The ballast components must be mounted and fastened on the luminaire ballast door panel 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.
- (l) Wiring. The lamp holder and ballast components must be completely wired, with connections made to a terminal board that is suitable for both copper or aluminum supply conductors to provide the 208/240 volts tap connections. The reactor and capacitor leads must not be smaller than #16 gauge conductors. These must be insulated with an approved 125°C insulation. All leads must be coded in an approved manner for proper identification. A complete wiring diagram must be displayed at an easy to read location on the interior of the luminaire.
- (m) Capacitor. The capacitor must be a non-PCB, a-c power type. The capacitor can must be coated with a moisture resisting paint, or must be fabricated of non-corrosive material.
- (n) Ballast. The ballast must be tapped linear reactor device incorporating a molded polyester-glass bobbin structure having a precision wound, insulated, magnetic wire coil with bobbin mounted push-on type electrical terminations. These terminations must provide good electrical and mechanical integrity as well as easy ballast replacement. The ballast must be treated in an approved manner to provide electrical and mechanical protection.
- (o) Wiring Connection. The ballast panel wiring must be "plug" connected to lamp and line leads for easy disconnect in removing the ballast.

Packaging.

- 5. (a) Packing. Each luminaire assembly must be packed in a suitable carton so secure that it must not be damaged in shipment and handling.
- (b) Marking. Each carton containing a luminaire must be clearly marked on the outside in letters not less than three-eighths (3/8) inch tall with the legend: "LUMINAIRE W/BALLAST, 400 WATT HP-SODIUM, IES TYPE II/TYPE III", the appropriate City Commodity Code Number, the name of the manufacturer, the date of manufacture, and the contract number under which the luminaire is furnished.

ROD: ANCHOR, STEEL, WITH HARDWARE

Subject.

- 2. This Specification states the requirements for steel anchor rods with hardware for the street light pole foundations.

General.

- (a) Specifications. The anchor rods must conform in detail to the requirements herein stated, and to the specifications of the American Society for Testing and Materials cited by ASTM Designation Number, of which the most recently published revision will govern.
- (b) Drawing. The drawings mentioned herein are issued by the Department of Streets and Sanitation, and are an integral part of this specification.

Anchor Rod.

- 3. (a) Fabrication. Each anchor rod must be fabricated in conformity with City of Chicago drawings numbered 806, 811, 830 and 844.
- (b) Material. The rods must be fabricated from cold rolled carbon steel bar meeting the requirements of ASTM Specification A-36, except that the Specification must be modified to provide a minimum yield point of 55,000 psi (379 MPa).
- (c) Thread. The straight end of each rod must be threaded as shown on City of Chicago drawing for that size rod, and must be American Standard, National Coarse.

Hardware.

- 4. Hardware furnished with the anchor rod must be as shown on the applicable drawing. It must include two (2) hexagonal nuts, American Standard Regular, two (2) flat washers, type B, series W, and one (1) lock washer, steel, helical spring. The nuts must have a Class 2 or 3 fit.

Finish.

- 5. (a) Galvanizing. The threaded end of each rod must be hot dipped galvanized for the distance shown on the applicable drawing. The thickness of the galvanized coating must not be less than 0.0021 inches. Each hexagonal nut and washer must be galvanized to the minimum thickness required by ASTM A-153, Class C, or ASTM B-454, Class 50. After galvanization, each anchor rod and nut must have a mating fit equivalent to the American Standard Class 2 or 3 fit for nuts and bolts.
- (b) Rust Inhibitor. With the hardware in place on the end of the bolt, the galvanized portion of the bolt must be coated with heavy No-Ox-I'd 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.

POLE: ANCHOR BASE, 3 AND 7 GAUGE, TAPERED TUBULAR STEEL, WITH HANDHOLE ENTRY

Subject

1. This specification states the requirements for tapered, tubular, 3 gauge and 7 gauge steel anchor base poles with mast arm supports. They will support street light luminaires and/or traffic signal mast arms and will be served by underground cables.

General

2. (a) Specifications. The poles must conform in detail to the requirements herein stated, and to the Specifications and Methods of Test of the American Society for Testing and Materials cited by ASTM Designation Number of which the most recently published revisions will govern.
 - (b) Acceptance. Poles not conforming to this specification will not be accepted.
 - (c) Bidders Drawings. Bidders must submit with their bids detailed scale drawings of the mast showing actual dimensions, details, and welds. Shop drawings must be original engineering drawings created by the manufacturer. The drawings must show every dimension necessary to show how all parts will fit each other and be properly held in assembly. These drawings must also be submitted in electronic format, preferably Microstation 95, if so requested by the City.
 - (d) Drawings. The drawings mentioned herein are drawings of the Department of Streets and Sanitation being an integral part of this specification cooperating to state necessary requirements.
 - (e) Sample. If requested by the Chief Procurement Officer, one completely assembled anchor-base pole of the manufacture intended to be furnished, must be submitted for review within fifteen (15) business days of receiving the request.
 - (f) Warranty. The manufacturer must warrant the performance and construction of the light poles to meet the requirements of this Specification and must warrant all parts, components, and appurtenances against defects due to design, workmanship, or material developing within a period of five years after the light poles have been delivered. This will be interpreted particularly to mean structural or mechanical failure of any element or weld, or failure of any portion of the painting system. The warranty must be furnished in writing guaranteeing material replacement including shipment, free of charge to the City. The Commissioner will be the sole judge in determining which replacements are to be made and the Commissioner's decision will be final.

Standards

3. (a) Assembly. Each anchor base pole must consist of a steel mast with handhole entry, entry door with machine screws, grounding nut, mast base plate, top cap for

mast, two (2) mast arm supports, bolt covers, and all necessary hardware required for complete assembly of these parts, ready for assembly, without special tools.

- (b) Interchangeability. Members of each pole type must be mutually interchangeable for assembly, so that no reworking will be required to make any member fit properly in the place of any other similar member of any other similar pole.
- (c) Design. Each pole type must conform in design and dimensions to the pertinent drawing(s) listed in Table "A".

Masts

- 4. (a) Mast Size. The outside diameters of the mast of each pole type must be as listed in Table A. The mast must be tapered at 0.14 inches per foot
- (b) Material. The mast must be fabricated from one length of No. 3, No. 7, or No. 11 Standard gauge steel meeting the material requirements of ASTM A606 for low alloy high strength coil steel, which, after fabrication, must possess an ultimate tensile strength of not less than 70,000 psi and a yield strength of not less than 60,000 psi, in accordance with ASTM A595, Grade C. Chemistry of the steel must be such as to insure resistance to atmospheric corrosion superior to that of ordinary copper bearing steel. Material certification is required. Manufacturer's steel meeting the specified physical and chemical requirements, and approved by the Commissioner, will be accepted.
- (c) Fabrication. The mast must be fabricated with not more than one (1) longitudinal weld. The weld must be ground smooth so that it is virtually invisible. There must be no lateral welds in the masts other than where the masts are welded to the steel bases. Each mast must be straight and centered on its longitudinal axis. Each mast must be formed on a mandrel and worked to form a round cross-section. The completed, unpainted masts must have smooth external surfaces free from protuberances, dents, cracks or other imperfections marring their appearance.
- (d) Base. The mast base must be a steel plate, of low alloy, high strength steel as noted in Par. 4 (b).

Plate Base. The base plate for each pole type must be as listed in Table "A". It must be fabricated from the same ASTM A606 low alloy, high strength steel as is used for the mast. After fabrication the steel must meet the requirements of ASTM A588. The mast must be inserted into the base to a maximum depth which will still allow for an adequate weld to be made between the bottom of the mast and the plate. A circumferential weld must be made between the mast and the base at both the top and underside of the plate. Non-metallic removable bolt covers which completely cover the anchor bolts and nuts must be provided. The covers must be attached with stainless steel screws coated with a non-seizing compound, or another type of non-seizing fastener, as approved by the Commissioner. The covers must enclose the anchor bolts and be secured in an approved manner. The base must be attached to the mast so that the bearing surface of the base is at right angles to the longitudinal axis of the mast. The vertical center line of the seam must be positioned so that no welds for the simplex attachments or the handhole opening will go through the seam.

Anchor Rod Openings. All anchor rod openings for each pole type must have a width as listed in Table "A". Each opening must be sized to have a circumferential slot length equal to 15 degrees of the circumference.

- (e) Mast Arm Support Plates. The mast arm support plates will be made of cast steel conforming to the requirements for Grade 65-35 cast steel of ASTM A27, or equivalent, subject to approval. They must neatly fit the external surface of the mast. The upper mast arm support plate must have a hollow protuberance, the hole of which must be approximately equivalent to two (2) inches in diameter, extending into the interior of the pole providing a smooth surface for the lamp cables to rest upon. The mast arm support plates must be designed so that they will carry the mast arm and hold it in the proper position for fastening the mast arm to the mast. The design of the mast arm support plates must be a two (2) bolt type as shown on Drawing No. 659.
- (f) Provision for Ground. A 1/2-13 square nut must be welded to the inside of the mast on the handhole entry frame for a ground connection.
- (g) Entry. A vertical doorframe carrying a removable door providing access to the interior of the mast must be welded into a close fitting opening centered approximately 15 inches above the bottom of the base. The doorframe must be formed and welded of steel with a cross section of two and one-quarter (2-1/4) inches wide by one-quarter (1/4) inch thick so as to adequately reinforce the opening of the mast. The internal horizontal clearance of the doorframe must be four and three-quarter (4-3/4) inches; its internal vertical clearance must be seven (7) inches. Its upper and lower ends must be semi-circular meeting its straight sides tangentially. The radius of this opening must be two and three-eighths (2-3/8) inches. The vertical center line of the entry must be at a right angle clockwise from the vertical center line of the mast arm supports. The frame must have two welded tabs; one at the top and one at the bottom of the door frame. These tabs must be drilled and tapped to accept a 1/4-20 UNC screw. The top hole must be located 13/16 of an inch from the top of the opening. The bottom hole must be located 13/16 of an inch from the bottom of the opening. The 1/4-20 machine screws must be stainless steel with hex heads, meeting the requirements of ASTM A193. The screws must be treated with a compound to prevent seizing. Other non-seizing types of screws and fasteners may be considered. An alternate method of attachment consisting of a removable hinge on the bottom with a screw connection at the top may be considered. (The above requirements apply to all pole masts except those with a 10 inch bolt circle. Poles with 10 inch bolt circles must have handhole openings of 3" by 5". All other requirements apply.)
- (h) Door. The removable door must be formed of sheet steel approximately one-eighth (1/8) inch thick. It must be flat or dished depending upon the pole type, and fit the doorframe closely so that it will stay in proper position even if its locking screws are slightly loosened. The door must be drilled top and bottom to accept the 1/4-20 hex head machine screws which will fasten the door to the doorframe. A half-circle piece of steel must be welded by the screw opening, to allow only a socket wrench to be used. All doors must be interchangeable. An alternate method of attachment using an internal hinge at the bottom of the door with a screw at the top of the door will be considered. Any alternate method will be subject to approval by the Commissioner or his duly authorized representative.

- (i) Locking Device. Any other door locking device, other than the one outlined above in (g) and (h), must be approved by the Commissioner or his duly authorized representative.
- (j) Tag. To each pole must be attached immediately below the handhole, by mechanical means and not by adhesive, a stainless steel tag with a stamped or embossed legend which must include the pole outside diameter at the base, the overall length, and the gauge; i.e., 12.5" X 34'-6" X 3 gauge.
- (k) Structural Requirements. The mast must be manufactured in accordance with AASTHO's 1994 version of the "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals". The shaft and base assembly must be designed to meet AASTHO's 1994 criteria for 80 MPH wind loading with a 30% gust factor. The poles must be designed appropriately for Chicago applications for both street lighting and traffic signal applications, including signal mast arms.

Top

- 5. (a) Design. The mast top must be essentially conical with a globe-shaped upper-end and having a minimum wall thickness throughout of not less than 1/4 inch. The cone portion must meet the skirted portion of the top in a smooth filet, the skirt must enclose the top 7/8" inches of the mast. Three stainless steel, or other similar approved material, set screws not less than 3/4 inches long must be equally spaced in tapped holes around the skirt and must hold the top securely in place atop the mast. The design of the top must be similar to one shown on Drawing #11420A.
- (b) Material. The top must be aluminum alloy 356-F per ASTM B108. It must have smooth surfaces, neat edges and corners and be free from fins, holes or other casting flaws. Non-metallic tops may be substituted if approved by the Commissioner.
- (c) Finish. Tops must be painted as herein specified.

Hardware

- 6. All the hardware necessary to complete the assembly of the pole must be furnished. All hardware will be as specified elsewhere in these specifications. Hardware not specified elsewhere must be stainless steel meeting the requirements of ASTM A193, or equal corrosion-resistant non-seizing metal, or a non-metallic material subject to approval by the Commissioner.

Welding

- 7. (a) General. Every welded joint must be made in conformity with the proper interpretation of the standard welding symbols of the American Welding Society as indicated on the drawings; however, each bidder must submit with his proposal a drawing showing the sizes and types of welds, must state the type of electrode, and must describe the welding methods, he proposes to use in fabricating the pole.

- (b) Testing. Welds must be inspected for penetration and soundness of the welds by the magnetic particle inspection method or by radiography. Acceptance or rejection will be governed by the same conditions as in Section 9. If the magnetic inspection process is to be used, the dry method with the direct current must be employed. All transverse welds must be magnetized by the "prod" (Circular magnetization) method. Longitudinal welds may be magnetized by either circular or longitudinal magnetization.

Painting

8. (a) Oil and Grease Removal. All metal surfaces must be washed with an alkaline detergent to remove any oils or grease.
- (b) Metal Cleaning. All exterior metal surfaces must be cleaned by blasting with a combination of shot and grit to remove all dirt, mill scale, rust, corrosion, oxides and foreign matter and provide a "near white" surface in accordance with SSPCS-SP10. Included in this process must be the interior base section of the mast to a minimum height of twelve (12) inches.
- (c) Chemical Pretreatment. The cleaned metal surfaces must then be treated with a hot, pressurized iron phosphate wash and must be dried by convection heat.
- (d) Primer Coat. All exterior surfaces are to be coated with Tnemec 90-97 corrosion-inhibiting zinc-rich aromatic urethane to a minimum dry film thickness of 2.5 mils (.0025"). The aromatic urethane is to consist of a zinc dust content not less than 83% by weight in dried film. The coating must be airless-spray applied and moisture cured.
- (e) Finish Coat. All exterior surfaces are to be subsequently coated with Tnemec Endura-Shield II 1074 aliphatic acrylic polyurethane to a minimum dry film thickness of 3.0 mils (.003"). The coating must be airless-spray applied and cured in a gas-fired convection oven by heating the steel substrate to between 150° Fahrenheit and 220° Fahrenheit.
- (f) Interior Coat. Interior surfaces are to be coated with red oxide rust inhibitive alkyd primer to a dry film thickness of 1.5 mils.
- (g) Durability. Both the exterior and interior coats must be capable of passing 1,000 hours of salt spray exposure as per ASTM B117 in a five percent (5%) NaCl (by weight) solution at 95°F and 95% relative humidity without blistering. Before test, the panel must be scribed with an "X" down to bare metal.
- (h) Coating Measurement. Measurement of coating thickness must be done in accordance with SSPC-Pa 2-73T, "Measurement of Dry Paint Thickness with Magnetic Gauges," except that the lowest "single spot measurement" in an area of two square inches must be not less than 5.5 mils.
- (h) Color. Color must be gloss black unless otherwise noted in the order. A color sample must be submitted for approval prior to fabrication.
- (j) Alternate Methods. Alternate painting methods may be reviewed and tested on a

case by case basis. However, no coating method will be accepted unless the Commissioner judges such alternate to be equal to the coating herein specified.

Mast Test

9. (a) General. All completed masts must be available for testing for maximum deflection and set. The masts must meet the structural requirements of Section 4(k). Unless specifically authorized in writing, all tests must be made at the works of the manufacturer. The tests must be witnessed and certified by an engineer from the Bureau of Electricity. If an engineer from the Bureau is not available, an independent consultant, approved by the Bureau, must witness and certify the tests. There will be no cost to the City for this. A record of every test must be made and a certified copy of the test record must be submitted to the Commissioner before the masts are shipped.
- (b) Lot. Tests for welds, deflection and set of the mast and of the mast arm supports must be made upon three (3) masts of the first fifty (50) in every order. An additional one (1) mast must be tested for each additional fifty (50) masts in the order. The selection of masts for testing must be random from the entire completed lot. If any of the masts in any lot fail to meet the test, an additional three (3) masts of the same lot must be tested. If any of these masts fail to meet the test requirements, the entire lot will be subject to rejection, except that the manufacturer may subject each mast in the lot to the test, and those which fulfill the requirement will be accepted. After testing, each base weld must be inspected by the magnetic particle method to determine that the welds have not been affected.
- (c) Mast Requirements. With base rigidly anchored, a test load as indicated in Table A must be applied at a point approximately two feet (2'0") from the free end. The load must be applied at right angles to the center line of the mast and in the same vertical plane. The deflection must not be greater than that indicated in Table A. Within one (1) minute after the test load is released, measurement must be made of the set taken by the mast. This set must not be greater than that indicated in Table A. The deflection measurement device must be reset to zero and the test load must be reapplied. The deflection must not change from the deflection noted in the first test by more than $\pm 5\%$. No measurable set must be noted within one (1) minute after test load is released.
- (d) Mast Arm Support (simplex) Requirements. With an appropriate mast arm firmly attached to the mast, a test load of 300 pounds must be applied to the mast arm as a side pull at a point seven (7) feet from the mast. After the test, the mast arm support welds on the mast must be tested by the magnetic particle method to determine that they have not been affected.
- (e) The contractor must include in his bid, the cost of travel, food and lodging for one (1) engineer. Travel for 150 miles or greater must utilize a major airline. Lodging accommodations must be equal to those provided at a Holiday Inn. The engineer must be given ten (10) working days notice of travel arrangements.

Packaging

10. (a) General. The poles must be shipped in twelve (12) pole bundles. Each pole must

be individually wrapped so that the pole can be bundled for shipping and unbundled for delivery to the City without damaging the pole or its finish.

- (b) Bundles. The bundles must consist of twelve (12) poles laid base to top to form an approximately rectangular cylinder. Materials such as lumber (2" x 4" min.), non-marring banding, and other appropriate bundling materials must be used to make a rigid, long lasting, bundle capable of being handled, shipped and stored without shifting of contents or breaking, subject to approval. Any bundles, in which either poles or packaging is received broken, damaged or with contents shifted, will not be accepted and it will be the responsibility of the supplier to return the bundle to its original destination at no cost to the City of Chicago. The bundles should be capable of being stacked two (2) high without breaking, or shifting of the contents. Each bundle must be capable of being lifted by a fork lift truck or crane and the bundles must be shipped on a flat bed truck to facilitate unloading. Each pole wrapping must be clearly labeled indicating the pole size, i.e. 34'6", 7 GAUGE, STEEL POLE, 15" B.C.
- (c) Hardware. The bolt covers and their attachment devices must be shipped with each bundle and packaged in twelve (12) sets of four (4) each. The package must be labeled and placed in a prominent position to facilitate accessibility, and must be attached to, or within, the bundle in such a manner as to assure safe delivery. Payment will be withheld for any bundle delivered without the accompanying hardware. Pole caps must be attached at the manufacturer's facilities, or be packed separately in a manner similar to the bolt covers, and the same payment conditions will prevail. Cracked, broken or chipped parts will be considered as an incomplete delivery as regards payment.
- (d) Delivery. All poles will be delivered to the Bureau of Electricity storage yard at 4101 South Cicero Avenue in Chicago, or to another location within the City as indicated on the order. Light pole information must include any recommendations of the manufacturer for storage.

Inspection

- 11. An inspector representing the City must have free entry at all times, while the work on the contract is being performed, to all parts of the manufacturer's works which concern the manufacture of poles. The manufacturer must afford the inspector, without charge, all reasonable facilities to satisfy him that the poles are being furnished in accord with these specifications. The final inspection must be made at point of delivery. Any poles rejected as defective must be removed and disposed of by the contractor at his sole cost.

TABLE A

POLE	GAUGE	BOLT CIRCLE	ANCHOR ROD	BASE 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

BASE: BALLAST HOUSING, NO. 7 U.S. STANDARD GAUGE STEEL

Subject.

1. This specification states the requirements for ballast housing base assemblies to be installed on concrete foundations and to serve as bases for anchor base type steel poles with mast arm attached street light luminaires.

General Requirements.

2. (a) Specifications. The base assemblies must conform in detail to the requirements herein stated and to the specifications of the American Society for Testing and Materials, of which the latest published revisions will govern.
- (b) Acceptance. Base assemblies not conforming to this specification will not be accepted.
- (c) Drawings. The drawing mentioned herein is a drawing of the Department of Streets and Sanitation. It is an integral part of this specification cooperating to state necessary requirements.
- (d) Shop Drawing. One complete set of shop drawings of the base assembly intended to be furnished must be submitted within fifteen (15) days upon request of the Chief Procurement Officer.
- (e) Sample. One completely assembled base of the manufacture intended to be furnished must be submitted upon request of the Chief Procurement Officer within fifteen (15) days after receipt of the request.

Detail Requirements.

3. (a) Drawing. The base assembly must conform in detail to the design and dimensions shown on Drawing No. 785, dated March 25, 1977.
- (b) Material. The steel used in the fabrication of the base assemblies must conform to ASTM A-606 Type 4 for the sides and door and to ASTM A-36 for the top, bottom and anchor plates.
- (c) Thickness. The sides and door must be No. 7 U.S. Standard Gauge; the top, bottom and Anchor Plates must be 3/4 inch plate.
- (d) Door. The door must be drilled top and bottom for, and furnished with, four (4) 1/4-20NCX3/4" button head stainless steel tamper resistant bolts for fastening top and bottom of door to base as shown on drawing No. 785. Ten (10) wrenches or drivers to fit the door bolts must be furnished with each fifty (50) base housings.
- (e) Hardware. The bolts, nuts, lock washers and anchor plates must conform to drawing. Four (4) galvanized hex head machine bolts, four (4) galvanized hex nuts, four (4) galvanized lock washers, and two (2) 3/4" thick steel anchor plates must be furnished with each base assembly. The anchor plates must be shipped bolted to the top of the ballast housing assembly using the hardware enumerated

above.

- (f) Welding. Every welded joint must be made in conformity with the proper interpretation of the standard welding symbols of the American Welding Society as indicated on the drawings. Each bidder must submit with his proposal a drawing showing the sizes and types of welds, the type of electrode and the welding methods he proposes to use in fabricating the base assembly.
- (g) Sandblasting. The door and ballast housing must be thoroughly sand blasted to remove all scale, oil or slag prior to painting.
- (h) Dating. The top of the ballast housing base must be stamped or engraved with the year of manufacture in numerals not less than 1/2" in height.
- (i) Painting. A coat of Penetrol must be applied on the inside weld of the base. The complete base assembly, inside and outside, is to be given a coat of iron oxide zinc chromate primer meeting the requirements of Federal Specification TT-P-636B.

Testing.

- 4. (a) Chemical Composition. Certified reports from the steel manufacturer must be furnished to the city upon request of the Purchasing Agent.
- (b) Test Specimens. Must conform to the requirements of ASTM Specifications A-36 and A-606 Type 4.
- (c) Strength Tests. One test specimen of the metal in each order of 50 base assemblies or less must be tested for tensile strength and elongation, in accordance with ASTM Standards.
- (d) Welding Tests. One percent (1%) of the longitudinal and circumferential welds of the base assembly must be inspected for penetration and soundness of the welds by the magnetic particle inspection method or by radiography. If the magnetic inspection process is used, the dry method with direct current must be employed. All transverse welds must be magnetized by the "prod" (circular magnetization) method. Longitudinal welds may be magnetized by either circular or longitudinal magnetization.
- (e) Certificate. One certified copy of the test data sheet must be furnished to the City before delivery of the bases.

Packing.

- 5. When packed for transportation and delivery as per paragraph 3(e), the base assemblies must be thoroughly blocked or otherwise protected to prevent damage to painted surfaces.

Inspection.

- 6. An inspector representing the City must have free entry at all times, while the work on the contract is being performed, to all parts of the manufacture of these base

assemblies. The manufacturer must afford the inspector, without charge, all reasonable facilities to satisfy him that the base assemblies are being furnished in accord with this specification. The final inspection must be made at the facilities of the manufacturer.

MAST ARMS: 4-, 8-, 12-, AND 15-FOOT: STEEL

Subject

1. This specification covers the requirements for 4-, 8-, 12-, and 15-foot steel mast arms for supporting street light luminaires.

General

2. (a) Specifications. The mast arms must conform in detail to the requirements herein stated and to the Specifications and Methods of Test of the American Society for Testing and Materials cited by ASTM Designation Number of which the most recently published revision will govern.
- (b) Acceptance. Mast arms not conforming to this specification will not be accepted.
- (c) Drawings. The drawings mentioned herein are drawings of the Department of Streets and Sanitation. They are integral parts of this specification cooperating to state necessary requirements.
- (d) Bidders Drawings. Bidders must submit with their bids detailed scale drawings of the mast arms and attachments showing actual dimensions, details, and welds. Shop drawings must be original engineering drawings created by the manufacturer. The drawings must give every dimension necessary to show how the parts will fit each other and be properly held in assembly. These drawings must be submitted in electronic format, preferably Microstation 95, if so requested by the City.
- (e) Sample. One complete mast arm of each size and of the manufacture intended to be furnished must be submitted within fifteen (15) business days upon request of the Chief Procurement Officer.
- (f) Warranty. The manufacturer must warrant the performance and construction of the mast arms to meet the requirements of this Specification and must warrant all parts, components, and appurtenances against defects due to design, workmanship, or material developing within a period of three years after the mast arms have been delivered. This will be interpreted particularly to mean structural or mechanical failure of any element or weld, or failure of any portion of the painting system. The warranty must be furnished in writing guaranteeing material replacement including shipment, free of charge to the City. The Commissioner will be the sole judge in determining which replacements are to be made and the Commissioner's decision will be final.

Design

3. (a) 4-Foot Mast Arm. Each 4-foot mast arm must be fabricated from a continuous, single piece, two (2) inch "extra strong" steel pipe conforming to the requirements

of ASTM A53, Table X2. It must conform in detail with the mast arm shown on Drawing Number 661.

- (b) 8-Foot Mast Arm. Each 8-foot mast arm must be fabricated from a continuous, single piece, two (2) inch "extra strong" steel pipe conforming to the requirements of ASTM A53, Table X2. It must conform in detail with the mast arm shown on Drawing Number 620.
- (c) 12-Foot Mast Arm. Each 12-foot mast arm must be fabricated from two (2) continuous, single piece, two (2) inch "standard" steel pipes conforming to the requirements of ASTM A53, Table X2. It must conform in detail with the mast arm shown on Drawing Number 839.
- (d) 15-Foot Mast Arm. Each 15-foot mast arm must be fabricated from two (2) continuous, single piece, two (2) inch "standard" steel pipes conforming to the requirements of ASTM A53, Table X2. It must conform in detail with the mast arm shown on Drawing Number 840.
- (e) Mast Arm Attachment. The mast arm attachment to be welded to all mast arms will be a steel forging per ASTM A668, Class D, or cast steel conforming to the requirements for Grade 65-35 cast steel of ASTM A27, or can be fabricated from corrosion resistant steel plate such as "Cor-Ten" or approved equal. It must be so designed that it may be fitted over the mast arm supports on the pole and be held by the mast arm supports in proper position without other support. The attachment must conform to the details shown on Standard Drawing 724. Provision must be made for fastening the attachment to each mast arm support by two special screws and washers as noted in Section 6.
- (f) Entryway for Wires. A drilled opening lined with a neoprene grommet having inserted therein a neoprene plug must be provided on the underside of the upper member of all arms approximately three inches from the point of attachment. The clear opening must not be less than 5/8 inch in diameter. Its design must be submitted for approval by the Commissioner or his authorized representative.
- (g) Mast Arm Members. All mast arm members must conform with the type of steel required for the arm specified. The members must be continuous lengths of pipe cut to the proper size to fabricate the mast arm lengths requested. No butt welded, swaged and welded or other pieced together configurations of pipe lengths will be accepted. The outer and inner surfaces of the pipes must be smooth and even without protrusions, nicks, holes or other imperfections.

Painting

- 4. (a) Oil and Grease Removal. All metal surfaces must be washed with an alkaline detergent to remove any oils or grease.
- (b) Metal Cleaning. All exterior metal surfaces must be cleaned by blasting with a combination of shot and grit to remove all dirt, mill scale, rust, corrosion, oxides and foreign matter and provide a "near white" surface in accordance with SSPCS-SP10. Included in this process must be one to two inches of the interior section of the mast arm.

- (c) Chemical Pretreatment. The cleaned metal surfaces must be treated with a hot, pressurized iron phosphate wash and must be dried by convection heat.
- (d) Exterior Coat. A Thermosetting, polyester powder coat must be applied electrostatically to all cleaned and treated surfaces to a uniform eight (8) mil thickness in a one coat application. This powder coat must be cured in a convection oven at a minimum temperature of 400°F to form a high molecular weight fusion bonded finish.
- (e) Alternate Methods. Alternate powder coat methods may be reviewed and tested on a case by case basis. However, no coating method will be accepted unless the Commissioner judges such alternate to be equal to the coating herein specified.
- (f) Interior Coat. The interior metal surfaces must be powder coated with a thermoplastic hydrocarbon resin containing corrosion inhibitors. The resin must be formulated for application over untreated metal surfaces. The resin must be applied at a temperature of approximately 200°F to a minimum thickness of three (3) mils. The interior thermoplastic coat must overlap the interior, thermosetting base coat by approximately one (1) inch. Alternate interior coatings may be used subject to prior approval of the Commissioner.
- (g) Durability. Both the exterior and interior coats must be capable of passing 1,000 hours of salt spray exposure as per ASTM B117 in a five percent (5%) NaCl solution at 95°F and 95% relative humidity without blistering.
- (h) Coating Measurement. Measurement of coating thickness must be done in accordance with SSPC-PA 2-73T, "Measurement of Dry Paint Thickness with Magnetic Gauges," except that the lowest "Single spot measurement" in an area of two square inches must be not less than 7.0 mils.
- (i) Color. Color must be gloss black, unless otherwise specified in the order. A color chip sample must be submitted for approval prior to fabrication.

Welding

- 5. (a) Standards. Every weld must be made in conformity with the proper interpretation of the standard welding symbols of the American Welding Society as indicated on the drawings; however, each bidder must submit with his proposal a drawing showing the sizes and types of welds, must state the type of electrode, and must describe the welding methods he proposes to employ in fabricating the mast arm.
- (b) Testing. The welds must be inspected for penetration and soundness by the magnetic particle inspection method or by radiography. If the magnetic inspection process is used, the dry method with direct current must be employed.

Screws

- 6. Two (2) special 1/2" - 13 NC x 1-1/2" long stainless steel cap screws, and two (2) stainless steel flat washers, must be provided for each mast arm attachment.

Mast Arm Tests

7. (a) General. Tests must be made upon three (3) of the first fifty (50) arms in any order. An additional one (1) arm must be tested for each additional fifty (50) arms in the order.
- (b) 4-Foot Mast Arm. The 4-foot mast arm, when securely attached to a suitable and proper supporting structure, must withstand a side pull of not less than three hundred (300) pounds applied at a point three feet six inches (3'-6") from the connection to the supporting structure without failure of welds.
- (c) 8-Foot Mast Arms. The 8-foot mast arm, when securely attached to a suitable and proper supporting structure, must withstand a side pull of not less than three hundred (300) pounds applied at a point seven (7) feet from the connection to the supporting structure without failure of the welds.
- (d) 12-Foot and 15-Foot Mast Arms. The 12-foot mast arm and the 15-foot mast arm, when securely attached to a suitable and proper supporting structure, must withstand a side pull of 300 pounds applied at a point seven (7) feet from the connection to the supporting structure without failure of the welds.
- (e) Rejection. If any of the mast arms in any lot fail to meet the test, an additional three (3) arms in the same lot must be tested. If any of these mast arms fail to meet the test requirements the entire lot will be subject to rejection, except that the manufacturer may subject each mast arm in the lot to the test, and those which meet the requirements will be accepted.
- (f) An Engineer from the Bureau of Electricity must be present to witness the testing procedures. If an engineer from the Bureau is unavailable, an independent consultant, approved by the Bureau, must witness and certify the tests. There will be no cost to the City for this. The contractor must include in his bid, the cost of travel, food and lodging for one (1) engineer. Travel for 150 miles or greater must utilize a major airline. Lodging accommodations must be equal to those provided at a Holiday Inn. The engineer must be given ten (10) working days notice of travel arrangements.

Packaging

8. (a) General. The arms must be shipped in bundles. Each arm must be individually wrapped so that the arm can be bundled for shipping and unbundled for delivery without damage to the arm or its finish. Materials such as lumber(2"x4" min.), non-marring banding, and other appropriate bundling materials must be used to make a rigid, long lasting, bundle capable of being handled , shipped and stored without shifting or breaking of the contents. Any bundles, in which either the mast arms or packaging is received broken, damaged or with contents shifted, will not be accepted and it will be the responsibility of the supplier to return the bundle at no cost to the City. Each bundle must be capable of being lifted by a fork lift truck or crane and the bundles must be shipped in a flat bed truck to facilitate unloading. Each arm wrapping must be clearly labeled indicating the arm size, i.e. 8' STEEL LUMINAIRE MAST ARM.
- (b) The hardware must be shipped with each bundle. The package must be labeled

and placed in a prominent position to facilitate accessibility, and must be attached to, or within, the bundle in such a manner as to assure safe delivery.

- (c) All mast arms will be delivered to the Bureau of Electricity storage yard at 4101 South Cicero Avenue in Chicago, or to another location within the City as indicated on the order.

CABLE: SINGLE-CONDUCTOR, COPPER 600 VOLT

Subject

1. This specification states the requirements for cables intended to be used as conductors in 120/240 VAC, 60 cycle, single phase, street lighting circuits. The cables will be installed in underground ducts or conduit.

General

2. (a) Specifications. The cable must conform in detail to the requirements herein stated, and to the applicable portions of the latest revisions of the specifications and methods of test of the following agencies:
- (1) ICEA Specification S-95-658
 - (2) IEEE Standard 383
 - (3) ASTM Standard E662-06
 - (4) ASTM Standard D470-05
 - (5) U.L. 44
 - (6) U.L. 854
- (b) Acceptance. Cable not in accordance with this specification will not be accepted.
- (c) Sample. If requested by the Chief Procurement Officer, a three (3) foot sample of the cable intended to be provided under this specification must be sent to the attention of the Engineer of Electricity within fifteen (15) days of receipt of such request.
- (d) Warranty. The manufacturer must warrant the cable to be first class material throughout. In lieu of other claims against them, if the cables are installed within twelve (12) months of date of shipment, the manufacturer must replace any cable failing during normal and proper use within two years of date of installation. All replacements under this warranty must be made free of charge F.O.B. delivery point of the original contract.

Construction

3. This cable must consist of a round copper conductor with a tight fitting, free stripping, concentric layer of ethylene propylene (EPR) insulation and a concentric low lead chlorosulfonated polyethylene (CSPE) jacket extruded in tandem with, and bonded to, the insulation, or ethylene propylene (EPR) insulation only. The cable must be rated for continuous duty in wet or dry conditions at 90° C operating temperature, 130° C emergency overload temperature and 250° C short circuit temperature.

Conductor

- 4. (a) Material. The conductor must either be soft or annealed round copper wire.
- (b) Specifications. The conductor must meet the requirements of ASTM B3, B8 or B258, as applicable.
- (c) Sizes. The conductor size must be as stated in the PROPOSAL and in accordance with all requirements in Table A of this specification.
- (d) Stranding. The number of strands, must be as indicted in Table A. Stranding must meet the requirements of ASTM B8, Class B.

Insulation

- 5. (a) Type. The insulation must be ethylene propylene rubber compound meeting the physical and electrical requirements specified herein.
- (b) Thickness. The insulation must be circular in cross-section, concentric to the conductor, and must have an average thickness not less than that set forth in Table A of this specification, and a spot thickness not less than ninety percent (90%) of the average thickness.
- (c) Initial Physical Requirements:
 - 1. Tensile strength, min., psi. 1,200
 - 2. Elongation at rupture, min. % 250
- (d) Air Oven Exposure Test. After conditioning in an air oven at 121 +/- 1°C for 168 hours using methods of test described in ASTM-D 573:
 - Tensile strength, minimum percent of unaged value.....75
 - Elongation at rupture, minimum percent of unaged value.....75
- (e) Mechanical Water Absorption:

GRAVIMETRIC METHOD: After 168 hours in water at 70+/- 1°C:
water absorption, maximum, milligrams per square inch.....5
- (f) Cold Bend Test Requirements. The completed cable must pass the "Cold-Bend, Long-Time Voltage Test on Short Specimens" of ASTM D-470 except that the test temperature must be minus (-) 25°C.
- (g) Electrical Requirements
 - 1. Voltage Test. The completed cable must meet an A.C. and D.C. voltage test in accordance with ASTM D-470 and D-2655.
 - 2. Insulation Resistance. The completed cable must have an insulation resistance constant of not less than 20,000 when tested in accordance with methods shown in ASTM D-470.

Jacket

6. (a) Type. If the cable is jacketed, the jacket must be a chlorosulfonated polyethylene (CSPE) compound meeting the physical and electrical requirements specified herein. The CSPE jacket must meet CFR Title 40, Part 261, for leachable lead.
- (b) Thickness. The jacket must be circular in cross-section, concentric with the insulation, must have an average thickness not less than that set forth in Table A of this specification and a spot thickness not less than ninety percent (90%) of the average thickness.
- (c) Initial Physical Requirements:
1. Tensile strength minimum PSI 1800
 2. Elongation at rupture, minimum percent 300
- (d) Air Oven Exposure Test. After conditioning in an air oven at 121 +/- 1°C for 168 hours:
1. Tensile strength, minimum percent of unaged value 75.
 2. Elongation at rupture, minimum percent of unaged value 60
- (e) Mechanical Water Absorption. After 168 hours at 70 +/- 1°C:
1. Milligrams per square inch, maximum 20

Testing

7. (a) General. Tests must be performed on insulation, jacket and completed cables in accordance with applicable standards as listed in these specifications. Where standards are at variance with each other or with other portions of this specification, the most stringent requirements, as determined by an engineer from the Bureau of Electricity, will apply. All tests must be conducted on cable produced for this order. Where cable insulation and/or jacket thickness preclude obtaining samples of sufficient size for testing, special arrangements must be made with the engineer to obtain samples of unprocessed materials directly from the extrusion feed bins which will be separately processed and prepared for tests.
- (b) Number Of Tests. Insulation and jacket tests must be conducted on samples taken every 25,000 feet or fraction thereof of each conductor size. In no case must samples be taken closer than 15,000 feet apart.
- (c) Witness Tests. Where the quantity of cable on a single purchase order is 250,000 feet or more, all insulation and jacket tests must be witnessed by an engineer from the Bureau of Electricity, if so requested by the City. Included in these tests will be a 70,000 BTU per hour flame test in accordance with IEEE 383. Reels to be tested will be selected at random. The contractor must include in his bid, the cost of travel, food and lodging for one (1) engineer. Travel for 150 miles or greater must utilize a major airline. Lodging accommodations must be equal to those provided at a Holiday Inn. The engineer must be given ten (10) working days notice of all travel arrangements.

- (d) Test Reports. No cable may be shipped until certified copies of all factory tests, including witness tests where applicable, have been reviewed and approved by the engineer.
- (e) Acceptance. Samples must be taken from each reel and must successfully conform to all tests specified herein. Reels from which samples fail to conform, will be rejected.

Packaging

8. (a) Cable Marking. The cable must be identified by a permanently inscribed legend in white lettering as follows:

1/c No. (conductor size) AWG-600V-90°C-EPR or EPR/CSPE

The legend must be repeated at approximately eighteen (18) inch intervals on the outside surface of the cable parallel to the longitudinal axis of the conductor. A sequential footage marking must be located on the opposite side from the legend.

- (b) All cable will be black pigmented. When three conductors (triplex) are specified, one conductor will be black, another will be red or black with a red tracer, the smaller of the conductors must have a green colored jacket and the three conductors must be triplexed with a 16"-18" lay. The insulation color must not be unduly affected by cable installation, or prolonged exposure to either direct sunlight or moisture. Where the quantity of triplex cable exceeds 80,000 feet, witness testing as outlined in section 7(c) will apply.
- (c) Reels. The completed cable must be delivered on sound substantial, non-returnable reels. Both ends of each length of cable must be properly sealed against the entrance of moisture and other foreign matter by the use of clamp-on cable caps, such as the Reliable Electric Company neoprene cable cap No. 1405, or equal. The ends must be securely fastened so as not to become loose in transit. Before shipment, all reels must be wrapped with cardboard or other approved wrapping.
- (d) Footage. Each reel must contain the length of cable as set forth in Table A of this specification. Alternate lengths may be considered.
- (e) Reel Marking. A metal tag must be securely attached to each reel indicating the reel number, contract number, date of shipment, gross and tare weights, description of the cable, the total footage, and the beginning and ending sequential footage numbers. Directions for unrolling the cable must be placed on the reel with an approved permanent marking material such as oil-based paint or a securely attached metal tag.

TABLE "A"

CONDUCTOR		INSULATION/JACKET THICKNESS		A-C TEST	REEL LENGTH
<u>AWG</u>	<u>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

**PEDESTRIAN SIGNAL HEAD, 1-FACE, BRACK MOUNTED WITH COUNTDOWN TIMER
PEDESTRIAN SIGNAL HEAD, POLYCARBONATE, LED, COUNTDOWN, BRACKET MOUNTED**

1. Description. This item will consist of furnishing and installing a pedestrian signal on a street light pole, a traffic signal pole or a traffic signal post as shown on the plans, as specified herein, or as directed by the Engineer. The signal may be installed as a single unit on a pole or in combination with other pedestrian signals or with traffic signals of various types and sizes. Specific installations and configurations are shown on Drawing Numbers 834 and 835 entitled "Standard Traffic Signal Mounting Details".

The method of mounting will be indicated on the plans, or as directed by the engineer. Each signal face must be pointed in the direction of the marked cross-walk area for the pedestrians it is intended to control.

2. Material. The pedestrian signal head material must be consistent with the requirements

of Bureau of Electricity Material Specification 1494. The countdown pedestrian signal must meet the requirements of Material Specification 1545. All housing units must be made of polycarbonate. The light source must be LED. Mounting hardware must meet the requirements of Material Specification 1495. Cable must meet the requirements of Material Specification 1475.

3. Installation. The signal must be mounted using pole mounting brackets banded to the pole with two strips of 3/4" stainless steel banding, single wrapped, one at the top and one at the bottom of the bracket, each secured with a stainless steel banding clip. The banding and clips must have a baked-on black finish. The mounting configuration connecting the signals to the mounting bracket must consist of polycarbonate brackets specifically made for mounting signal heads to the side of poles, to create the designated structure.

The bottom mounting bracket must be accurately located to cover a hole 1" in diameter for the cable entrance drilled into the pole at a height calculated to position the bottom signal face at a standard height of 10 feet, or a height indicated on the plans. The hole must be reamed or filed to remove all sharp edges or burrs which might damage cable during installation, or through vibration when the signals are in operation.

When the pedestrian signal is attached below a traffic signal head, the separate opening for cable may be omitted to eliminate additional weakening of the pole and the pedestrian signal cord will be installed using the same opening as the traffic signal cord.

Cable. The Contractor must provide and install a length of 8/C #16 AWG flexible electric cord, of sufficient length to extend without strain or stress from the terminal strip in the signal head to the terminal strip in the junction box mounted on the pole. The number of conductors in the cord, and the color coding of the conductors, must be sufficient to match the requirements of the signal head being installed, and must be so connected in accordance with Material Specification 1494. Both ends of the cable must be carefully stripped of six inches (6") of jacket and one inch (1") of insulation, and each conductor properly tinned. The service cord from the signal head must enter the pole through the bottom mounting bracket and enter the long sweep elbow to terminate by attachment to the terminal strip in accordance with the terminal strip connector schematic, Bureau of Electricity Drawing Number 12268-A.

During construction and until the installation is placed in operation, all signal faces must be hooded. The hooding material must be securely fastened so it will not be disturbed by inclement weather or wind

4. Method of Measurement. This work will be measured per each signal unit installed, completely wired and operational.
5. Basis of Payment. This work will be paid for at the contract unit price each for PEDESTRIAN SIGNAL HEAD, POLYCARBONATE, 1 FACE, LED, BRACKET MOUNTED WITH COUNTDOWN TIMER, which price will be payment in full for furnishing and installing the signal head complete.

ELECTRIC CABLE IN CONDUIT NO. 4, 2/C
ELECTRIC CABLE IN CONDUIT NO. 14, 7/C
ELECTRIC CABLE IN CONDUIT NO. 14 19/C

1. Description. This work will consist of furnishing and installing electric cable for traffic signals of the type, size and number of conductors as specified on the plans. The cable will be rated 600 volts and comply with the following requirements.
2. Traffic Signal Cable. All cable must conform to the requirements of Material Specification number 1537, for Traffic Signal Cable.
3. Installation. All cable must be installed in conduit, as indicated on the plans, with care to prevent damage to the insulation or cable. Suitable devices must be used in pulling the cable, and only approved lubricants should be used. All cables installed in conduit will be from the power source to the traffic signal controller cabinet, from the traffic controller cabinet to the traffic signal junction box, or from junction box to junction box. For cable terminating in a traffic signal controller cabinet or traffic signal junction box the following procedures must be followed:
 - a. Controllers.
 1. Remove thirty six inches (36") of neoprene jacket.
 2. Wrap vinyl electrical tape on two inches (2") of the neoprene jacket and two inches (2") on the exposed conductors.
 3. Remove one inch (1") of insulation and scrape copper conductor.
 4. Train cables neatly along the base and back of cabinet.
 5. Connect conductors to proper terminal lugs.
 - b. Traffic Signal Junction Box.
 1. Remove twenty four inches (24") of neoprene jacket.
 2. Wrap vinyl electrical tape on two inches (2") of neoprene jacket and two inches (2") on the exposed conductors.
 3. Remove one inch (1") of insulation and scrape copper conductor.
 4. Train cables neatly along the side and back of the box.
 5. Connect all conductors to terminal strip.

4. Cable Slack.

The length of cable slack that must be provided will be in accordance with the following schedule:

<u>Location</u>	<u>Length of Slack Cable (feet)</u>
Base of Controller	7
Detector, Junction Box	1
Base of Traffic Signal Post or Traffic Signal Pole	4
City Handhole	6
City Manhole	12
Commonwealth Edison Manhole	25

Cable slack in manholes/handholes must be trained and racked in the holes. If racks are non-existent, racks must be provided, and considered incidental and a part of this pay item.

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

5. Method of Measurement. The length of measurement must be the distance horizontally measured between changes in direction, and will include cable slack. All vertical cables will not be measured for payment.

6. Basis of Payment. This work will be paid for at the contract unit price per lineal foot for ELECTRIC CABLE IN CONDUIT NO. 4, 2/C, ELECTRIC CABLE IN CONDUIT NO. 14, 7/C, ELECTRIC CABLE IN CONDUIT NO. 14 10/C, or ELECTRIC CABLE IN CONDUIT NO. 14 19/C. This price will be payment in full for furnishing, installing, connecting, splicing, and testing of cable, and will include all labor, materials, equipment, tools, and incidentals necessary to complete the work, as specified herein, and as shown on the plans.

MAST ARM, STEEL, MONOTUBE, 16 FOOT
MAST ARM, STEEL, MONOTUBE, 30 FOOT

Description. This item will consist of furnishing and installing a steel, monotube, mast arm for the purpose of supporting traffic signals, and/or illuminated signs on an anchor base pole at the locations shown on the plans, or as specified or directed by the Commissioner. The length of the mast arm and the angular orientation of the arm relative to the centerline of the roadway will be as indicated on the plans.

A mast arm must be installed only on a 3 gauge pole, and the length of the mast arm will govern the minimum base diameter of the pole on which the arm is to be installed, in accordance with the following chart:

MAST ARM LENGTH (feet)	POLE BASE DIAMETER (inches)
16	10
20	10
26	10
30	11
35	12.5
40	12.5
44	12.5

Material. The mast arm must be 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, 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.

LUMINAIRE: WITH BUILT-IN BALLAST: FOR VERTICAL BURNING 150 WATT HIGH PRESSURE SODIUM VAPOR LAMP: WITH MODIFIED TYPE I (TWO-WAY OR FOUR-WAY) LIGHT DISTRIBUTION

INTENT

1. These specifications state the requirements for a street lighting luminaire, with built-in high power factor reactor ballast, for use with a vertical burning, 150 watt, high pressure sodium vapor lamp. The luminaire is to be mounted 20 to 30 feet above the roadway, attached to the end of a two-inch steel pipe. Luminaires furnished under these specifications must be completely assembled and ready for installation by the City of Chicago. These luminaires are known as residential crimefighters which provide keyhole to keyhole illumination.

GENERAL

2. (a) Information Required. Each bidder must submit with his proposal the following information pertaining to the luminaries he proposes to furnish:
 1. Outline Drawing.
 2. Complete description and weight.
 3. Isocandela diagrams showing complete information necessary to determine available light distribution of the luminaire.
 4. Isofoot-candle diagrams.
 5. Co-efficient of utilization curves.
 6. Charts showing distribution of light flux from the luminaire.
 7. Projected area in square feet.
 8. Manufacturer's name and catalog description of the luminaire.
 9. Candlepower curves showing vertical distribution in the plane of maximum candlepower and lateral distribution in the cone of maximum candlepower.
 10. IES formatted photometric curves must be provided in electronic format.
- (b) Approval. Wherever, "approval" and "approved" are used in this specification, they must mean a written approval by the Commissioner of Streets and Sanitation to be secured prior to proceeding with manufacture of these luminaires.
- (c) Sample. One completely assembled luminaire of the manufacture intended to be furnished must be submitted within fifteen (15) business days after the receipt of a request from the Chief Procurement Officer. The sample luminaire must be delivered to the Bureau of Electricity facility at 2451 South Ashland Avenue, Chicago, Illinois. Failure to provide a sample within the specified time frame will be cause for rejection.
- (d) Warranty. The manufacturer must warrant every luminaire against defects due to design, workmanship, or material developing within a period of one (1) year after the luminaire has been placed in service. This will be interpreted particularly to mean failure of any ballast component, loss of reflectivity of reflecting surface, and discolorations or fogging of the refractor impairing the transmission of light. Any luminaire or part thereof developing defects within the period specified must be replaced by the manufacturer without expense to the City. The Commissioner of

Streets and Sanitation will be the sole judge in determining which replacements are to be made, and his decision will be final.

DETAIL REQUIREMENTS

3. (a) Housing. The housing must be a precision aluminum die-casting. The wall thickness must be substantial and adequate enough to withstand the strains likely to be imposed on the housing when installed and in service. The housing must enclose the slip-fitter, lamp socket, photo control receptacle, reflector or optical system hood-baffle, terminal board, fuse block, and ballast components, with provision for proper mounting of these parts. The housing must have provision on its top surface, or otherwise, to permit leveling with a spirit level. The housing must be of such size and surface area, or must have "heat sink" characteristics, such that all enclosed components must operate within their designed operating temperatures under expected service conditions. Where a photo control receptacle is not required, the housing must be cast over the area where the photo control receptacle would normally be.
- (b) Assembly. Each luminaire must be delivered completely assembled, wired and ready for installation, but without the lamp or fuses. Each luminaire must be complete with all components specified herein, including but not limited to aluminum housing, refractor, refractor holder, reflector or optical system hood-baffle, ballast components, terminal board-fuse block, lamp socket, photo control receptacle, gaskets, slip fitter and all necessary hardware.
- (c) Current Design. The luminaire must be the latest, up-to-date design and of modern styling, subject to approval.
- (d) Projected Area and Weight. The projected area of this luminaire must not exceed 2.0 square feet, and its weight must not exceed 35 pounds with a 150 watt, high power factor reactor ballast.
- (e) 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 double 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. If the slip-fitter is built into the housing, it must be completely enclosed or partitioned off so that water and bugs must not enter the interior of the housing.
- (f) Lamp Socket. The mogul, multiple, porcelain enclosed lamp socket must be a high quality commercial product meeting ANSI C81.62-1991 standards. The socket must be UL certified. The socket must have integral lamp grips and a spring loaded center contact. The socket must be mounted in a manner to provide full and easy adjustability of both vertical and horizontal axis in order to obtain I.E.S. Type I and II distributions in short, medium and long classifications, as specified, all with the

same refractor. These positions must be properly marked so that the desirable adjustments can be made in advance on the ground in an easy and fool-proof manner. The manner of achieving the lateral distribution must be variable through the range from Type I to Type II, so as to permit intermediate distribution settings within this range. To assure good mechanical and electrical connections, the lamp leads must be directly connected to the socket contacts by welded or indented compression connections. Unless otherwise specified in the proposal, the socket position must be set to provide the "Modified Type I-Long" distribution, as herein defined.

- (g) Reflector. The optical system must be designed to perform properly and efficiently, with or without the use of a reflector. If reflector is required for proper photometric performance, it must be a clad-aluminum surface, "Alzak" class SI, polished to an approved highly specular finish, minimum reflectivity of 82%, and with a protective oxide coating of 7.5 milligrams per square inch, minimum. 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 to provide a totally enclosed and completely dustproof optical assembly. A silicone rubber 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. It must effectively filter-out dirt and particle size contaminants.
- (h) Refractor. The refractor must be molded, UV stabilized acrylic having a minimum cross-section of not less than 3/32" in thickness. It must contain prisms pressed on the inner and outer surfaces, and must be optically designed to direct by refraction the light from the lamp to produce vertical and lateral light distributions conforming to I.E.S. Type I and II, and short, medium and long classifications as elsewhere herein specified. Contractor is required to furnish refractors to provide the "Modified Type I" distribution with 2-way control.
- (i) Hood-Baffle. If the luminaire is designed to meet photometric performance requirements without the use of a reflector, it must have an aluminum hood-baffle in lieu thereof, which must completely isolate the optical system from the surrounding atmosphere and serve as a separating baffle from the electrical components in the housing. If necessary to permit ready access to the interior of the housing, the hood-baffle must be hinged in an approved manner so as to be opened with the lamp in the socket. Closure must be accomplished by means of an easily opening spring clip or friction catch. The hood-baffle must be securely seated and positioned in order to provide proper mating with the refractor, and positive sealing of the optical system. A silicon rubber or EPR (ethylene propylene rubber) gasket must be firmly cemented to the hood-baffle to provide a moisture and dust tight seal between the hood-baffle and refractor.

The socket mounting bracket may be attached to the hood-baffle. A "breathing" filter of fiberglass or other approved material must be incorporated in the hood-baffle. It must effectively filter out dirt and particle sized contaminants.

- (j) Refractor Holder-Door. The refractor holder-door must be a precision, aluminum die-casting which must be hinged to the luminaire housing, and must open downward approximately 90° to allow servicing of the lamp and access to electrical

parts. The hinging arrangement must be of rugged construction with corrosion resistant hinge fittings. The complete door must be removable, and must have a safety feature to prevent accidental unhinging. The refractor must be securely held in the holder-door, yet must be easily removed by means of single-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 will provide a definite snap action or visual indication that it is locked.

If separate door is provided for access to electrical parts enclosed in the housing, it, too, must be a precision aluminum die-casting of rugged construction and conform to the same hinging requirements as the refractor holder-door, except that method of latching and locking this auxiliary door must be subject to approval.

A large letter "C" must be cast into the bottom portion of the refractor holder-door or access door which encloses the ballast and electrical wiring. This embossed letter must be visible and identifiable from the ground when the luminaire is mounted at a 25-foot height.

- (k) Terminal Board-Fuse Block. A terminal board of high grade molded plastic or glazed porcelain of the barrier or safety type must be mounted within the housing in a readily accessible location. It must provide all terminals needed to completely prewire all luminaire components. The terminal board must either incorporate a barrier isolated section with fuse clips to take a 13/32" x 1 1/2" cartridge fuse, or a separate barrier protected fuse block must be provided.

The fuse block must be wired to the appropriate terminals. The terminal board-fuse block must have plated copper or plated brass, clamp-type pressure terminals of an approved type for "line" connections, to accommodate wire sizes from #12 to #8 A.W.G. The terminals for connection of internal components must be either the screw-clamp or quick disconnect type.

- (l) Photo control Receptacle and Cap. If the contract calls for photo-control, a standard three-prong, twist lock receptacle for a photo-control meeting ANSI standard C136.10-1988 must be mounted in the housing with provision for proper positioning of the photo-control. The photo-control is not required to be furnished, but a shorting cap with a three-prong plug having line-load prongs shorted together and meeting ANSI standard C136.10-1988 must be provided. If the contract calls for no photo-control, no receptacle will be provided and the housing must be cast over where the photo-control would normally be.

- (m) Reflector or Hood-Baffle Gasket. This gasket must be a silicone rubber of EPR (ethylene propylene rubber) 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.

- (or) Finish. The luminaire must have a light gray enamel baked on finish. Color must be Munsell No. 5BG 7.0/0.4 (designated A.S.A. No. 70). An alternate color may be specified, as per the order. Surface texture and paint quality is subject to approval. A color sample may be required.

BALLAST REQUIREMENTS

4. (a) General. The built-in-ballast must be a high power factor, linear type, low loss reactor. It must be designed to furnish proper electrical characteristics for starting and operating a 150 watt high pressure sodium lamp at temperatures as low as minus 20° F. 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.
- (b) Lamp Operation. The ballast must provide positive lamp ignition at an input voltage of 95 volts. It must operate the lamp over a range of input voltage from 95 to 125 volts 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.
- (c) Rating. The ballast must have properly coded wire leads for rated input voltage of 115 volts at 60 cycles, which must drive a nominal 55 volt lamp at 150 watts. The design range of input voltage for this ballast must be from + 6% to -8% of the nominal voltage (115 volts).
- (d) Lamp Current. The ballast must supply approximately 3.3 amperes to a 150 watt, 55 volt high pressure sodium lamp during operation, and not more than 4.8 amperes at starting.
- (e) Power Factor. The power factor of the ballast over the design range of input voltages specified above must not be less than 90%.
- (f) Line Current. With nominal input voltage applied, the input current under starting, short circuit or open circuit condition, must not exceed 2.5 amperes.
- (g) Lamp Wattage. The ballast must deliver 150 watt to a vertical burning nominal (55 volts) lamp when operating at the nominal (115 volt) input voltage. Wattage input to the nominal (55 volt) lamp must not vary more than a total of 30% over the input voltage design range of 106 volts to 122 volts.
- (h) Ballast Loss. Wattage loss of the ballast must not exceed 20 watts when delivering 150 watts to a nominal (55 volts) lamp at the nominal input (115 volt) voltage. The wattage loss must be measured with a nominal 55 volt lamp "hot" in the fixture.
- (i) 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.
- (j) Electronic Starter. The starter component must be a solid state device capable of withstanding ambient temperatures of 100° C. The starter must provide timed

pulsing with sufficient follow current to start the lamp. Minimum amplitude of the pulse must be 2,500 volts, with a minimum width of one (1) micro-second at 90% of peak, and must be applied within 20 electrical degrees of the peak of the open circuit voltage wave with a repetition rate of once each half cycle of a 60 cycle wave. Proper starting must be provided over a range of input voltage from 95 volts to 125 volts. The starter circuit-board must be encapsulated in an approved manner.

- (k) Crest Factor. Current crest factor must not be greater than 1.6 at nominal input voltage for a nominal vertical burning lamp.
- (l) Mounting. The ballast components must be mounted and fastened within the luminaire housing 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.
- (m) Wiring. The lampholder and ballast components must be completely wired, with connections made to an approved terminal board. The reactor and capacitor leads must not be smaller than #16 gauge conductors. These leads must be insulated with an approved class of insulation. All leads must be coded in an approved manner for proper identification. A complete wiring diagram must be displayed at a convenient location on the interior of the luminaire.
- (n) Capacitor. The capacitor must be an A.C. paper-oil, power capacitor. The capacitor must be coated with a moisture resisting paint, or must be fabricated of non-corrosive material.
- (o) Noise Level. The noise level of this ballast must be such that when installed in the luminaire and operating, no objectionable audible noise must be detected from directly beneath the luminaire, when field tested in a residential neighborhood, and mounted on a steel pole at the end of a 12-foot steel arm at a 21.5 foot light center height.
- (p) 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.

PHOTOMETRIC PERFORMANCE

5. (a) Light Distribution. By means of adjustable socket positioning, the luminaire must be capable of providing standard I.E.S. Type I and II, lateral distributions and short, medium and long vertical distributions in at least the following combinations:

1. Type I in short, medium and long.
2. Type II in short and medium.

Control of light distribution above the angle of maximum candlepower (degree of cutoff) may vary with particular distribution patterns provided.

- (b) Efficiency of the Luminaire. Light flux emitted by this luminaire with 150 watt, high pressure sodium lamp providing the "MODIFIED TYPE I - LONG" distribution must

not be less than the following:

	<u>LUMENS</u>	% OF TOTAL <u>LUMENS</u>
Downward - Street Side	5,120	32
Downward - House Side	<u>5,920</u>	<u>37</u>
Totals:	11,040	69

- (c) Average Illumination. The average initial horizontal illumination for the entire area represented by a 66 foot wide "right-of-way" of 320 foot length with only one luminaire contributing, and operating a 150 watt high pressure sodium lamp at a 21.5-foot light center height, and providing the "MODIFIED TYPE I - LONG" distribution designated above, must not be less than 0.38 foot candles.
- (d) Illumination Uniformity. Based on initial horizontal illumination provided by this luminaire for the conditions specified in paragraph (c) in preceding paragraph, the uniformity ratios must not be greater than the following:

<u>Ratio</u>	<u>For the Complete 66' x 320' Right-of-way</u>	<u>For Street Side or House Side Or House Side Parkway and Walk</u>
Avg. - Min.	26 to 1	21 to 1
Max. - Avg.	6 to 1	8 to 1

- (e) Brightness Control. Prismatic shielding must provide effective luminaire brightness control to street side and house side, such that luminance values for the indicated viewing angles must not exceed the values indicated below, when tested as follows:
1. Test Measurements. Brightness measurements (luminance) in candles per square inch must be made for the projected area of the luminaire refractor burning a 150 watt high pressure sodium lamp from six apparent viewing positions (three for "house side" and three for "street side").
 2. Instrumentation. The instrument to be used to make the luminance measurements must consist of a three foot (3') long tube large enough in diameter to accommodate a color corrected WESTON photocell at one end and having one-inch-square aperture at the opposite end, and covered on the inside surface with black velvet. A WESTON #622 micro ammeter must be calibrated with a reference standard of known luminance, and must be used to measure the cell response. A scanning fixture must be used to fix the position of the instrument's angle settings. It must also provide for vertical and horizontal "tracking" of the instrument "plumb" over the required ranges of traverse.
 3. Test Procedure. With the luminaire oriented to provide its normal distribution pattern, the instrument must be set so that a plane through the vertical axis of the luminaire and the axis of the tube must conform to required lateral (clockwise) angle with respect to the 0° (across street) reference, the tube must

be inclined in this plane at the specified vertical angle from nadir, with the aperture of the tube placed as close to the refractor as possible. Starting from one side, the uppermost one-inch luminous strip must be scanned-across and measurements taken at contiguous one-inch increments, without overlapping. Only full one-inch-square readings must be recorded. Successive horizontal scans must be made by lowering the complete instrument on its vertical axis an amount necessary to cover each luminous strip of the refractor without overlap.

4. Luminance Values. The maximum, full one-inch square reading taken over the projected face of the luminaire must be taken as the maximum value for each viewing position. The total number of full one-inch-square readings for all scans must be averaged (arithmetically) to obtain the average value of luminance for each viewing position. Luminance values for this luminaire must not exceed the values listed below:

Vertical Angle (from Nadir)	Lateral Angle (from reference Across Street)	Luminance Candles Square Inch	
		Average	Maximum
54°	180°	28	51
63°	136°	20	53
63°	224°	25	57
63°	0°	20	42
67°	35°	20	54
67°	325°	20	53

- (f) Modified Type - I Four Way Distribution. This luminaire with four-way refractor must provide a "MODIFIED TYPE I" distribution with four distinct candlepower lobes in the cone of maximum candlepower having a characteristic "four leaf-clover" lateral pattern. Orientation of the lobes must be such that angles between the centerlines of successive lobes must be approximately 95°, 85°, 85° and 95° respectively. A keying arrangement must be provided between the refractor and its holder to permit four individual settings of the refractor. As the reference position, align the centerline of that which makes a spread angle of 95° with both adjacent lobes with the centerline of the mounting arm. Angular displacement (in the "plan" view) taken clockwise and counterclockwise from this reference position through total angles of 30° and 65° will establish the four angular settings of the refractor in the luminaire.

The refractor must have molded into it the following designations to identify these angular settings:

Angular Setting	Designation
30° Clockwise	Alley Left
65° Clockwise	Street Left
30° Counterclockwise	Alley Right
65° Counterclockwise	Street Right

The vertical angle of maximum candlepower in each lobe must be approximately 76° and

the candlepower value at the 82° vertical angle in each lobe must not be less than 4200. Each candlepower lobe must have a lateral width of approximately 25°. Maximum candlepower in each lobe must not be less than 4500.

PACKING

6. Each luminaire must be securely packed in a carton so that it will not be damaged during handling and shipping. Each carton must be clearly labeled in letters not less than 3/8" tall with the legend: "150 WHPS CRIMEFIGHTER LUMINAIRE". The name of the manufacturer, the date of manufacture, City commodity code, and contract number must be clearly marked on the carton.

LUMINAIRE: WITH BUILT-IN BALLAST: FOR VERTICAL BURNING 310 WATT HIGH PRESSURE SODIUM VAPOR LAMP WITH TYPE II/TYPE III LIGHT DISTRIBUTION

INTENT

1. These specifications state the requirements for a street lighting luminaire, with built-in, high power-factor, linear reactor ballast, and electronic starter, for use with a vertical burning, 310 watt, high pressure sodium vapor lamp. The luminaire is to be mounted 31 feet above the roadway, attached to the end of a two-inch steel pipe. This luminaire is commonly known as an arterial street crimefighter because of the keyhole to keyhole illumination.

GENERAL

2. (a) Information Required. Each bidder must submit with his proposal the following information pertaining to the luminaires he proposes to furnish:
 1. Outline Drawing.
 2. Complete description and weight.
 3. Isocandela diagrams showing complete information necessary to determine available light distribution of the luminaire.
 4. Isofoot-candle diagrams.
 5. Co-efficient of utilization curves.
 6. Charts showing distribution of light flux from the luminaires.
 7. Projected area in square feet.
 8. Manufacturer's name and catalog description of the luminaire.
 9. Candlepower curves showing vertical distribution in the plane of maximum candlepower and lateral distribution in the cone of maximum candlepower.
 10. IES formatted photometric curves in electronic format.

DETAILED REQUIREMENTS

3. (a) Housing. The housing must be a precision aluminum die-casting. The wall thickness must be substantial and adequate to withstand the strains likely to be imposed on the housing when installed and in service. The housing must enclose the slip-fitter, lamp socket, photo control receptacle, reflector, terminal board, fuse block and ballast components, with provision for proper mounting of these parts. The housing must have provision on its top surface, or otherwise, to permit leveling with a spirit level. 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.

- (b) Approval. Wherever "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) Sample. One completely assembled luminaire with refractor, of the manufacture intended to be furnished, must be submitted within fifteen (15) business days after receipt of a request from the Chief Procurement Officer. The sample luminaire must be delivered to the Engineer of Electricity, City of Chicago, Bureau of Electricity.
- (d) Assembly. Each luminaire must be delivered completely assembled, wired, and ready for installation, but will not include the lamp or fuses. Each luminaire must be complete with all components specified herein, including but not limited to aluminum housing, acrylic refractor, refractor holder, reflector, ballast components, terminal board, fuse block, lamp socket, photo-control receptacle, gaskets, slip fitter and all necessary hardware.
- (e) Current Design. The luminaire must be the latest, up-to-date design and of modern styling, subject to approval.
- (f) Projected Area and Weight. The projected area of this luminaire must not exceed 3.0 square feet, and its weight must not exceed 38 pounds with a 310 watt, high power factor reactor ballast.
- (g) Warranty. The manufacturer must warrant every luminaire against defects due to design, workmanship, or material developing within a period of one (1) year after the luminaire has been placed in service. This will be interpreted particularly to mean failure of any ballast component, loss of reflectivity of reflecting surface, compatible performance of ballast with lamps of various manufacture, and discolorations or fogging of the refractor impairing the transmission of light. Any luminaire or part thereof developing defects within this period must be replaced by the manufacturer without expense to the City, and the Commissioner will be the sole judge in determining which replacements are to be made, and his decision will be final.
- (h) 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 double 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 must contain an approved shield around the pipe entrance to block entry of birds.

- (i) Lamp Socket. The mogul, multiple, porcelain enclosed lamp socket must be a high quality commercial product. The socket must have integral lamp grips and spring loaded center contact. The socket must be mounted in a manner to provide full and easy adjustability of vertical and/or horizontal axes in order to obtain I.E.S. Types II and III classifications as specified, all with the same refractor. These positions must be properly marked so that the desirable adjustments can be made in advance on the ground in an easy and "fool-proof" manner. The manner of achieving the lateral distribution must be variable through the range from Type II to Type III, so as to permit intermediate distribution settings within this range. To assure good mechanical and electrical connections, the lamp leads must be directly connected to the socket contacts by welded or indented compression connections. Unless otherwise specified in the proposal, the socket position must be set to provide the Medium, Type II distribution.
- (j) Reflector. The optical system must be designed to perform properly and efficiently with a reflector. The reflector must be either "Alzak" class SI or "Alglas" specular finish. 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 to provide a totally enclosed and completely dustproof optical assembly. 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. It must effectively filter out dirt and particle size contaminants.
- (k) Refractor. The refractor must be molded, UV stabilized acrylic having a minimum cross-section of not less than 3/32" in thickness (between the roots of prisms). It must contain prisms pressed on the inner and outer surfaces (including bottom) and must be optically designed to direct by refraction the light from the lamp to produce vertical and lateral light distributions conforming to I.E.S. Type II or III, and short and medium classifications as elsewhere herein specified. The refractor must be closed bottom, with uniform light transmission over the refractor surface in the direction of the maximum beams and over the entire bottom.
- (l) Refractor Holder-Door. The refractor holder-door must be a precision, aluminum die-casting which must be hinged to the luminaire housing and must open downward approximately 90 degrees to allow servicing of the lamp and access to electrical parts. 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 refractor must be securely held in the holder-door, yet must be easily removed by means of a single-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 will provide a definite snap action or visual indication that it is locked.
- (m) Ballast Access Door-Panel. A separate door must be provided for access to

electrical parts enclosed in the housing. It must be a precision aluminum die-casting of rugged construction. The door must be removable and must have a safety feature to prevent accidental unhinging. The hinge and fastening devices must be captive parts which will not become disengaged from the door panel. A large letter "C" must be cast into the bottom portion of the refractor holder-door or access door which encloses the ballast and electrical wiring. This embossed letter must be visible and identifiable from the ground when the luminaire is mounted at a 31 foot height. The letter "C" must be at least 1 3/4" wide by 3" high.

- (n) Terminal Board-Fuse Block. A terminal board of molded phenolic plastic of the barrier type must be mounted within the housing in a readily accessible location. It must provide all terminals needed to completely pre-wire all luminaire components. The terminal board must either incorporate a barrier isolated section with fuse clips to take two "small-dimension" (13/32" x 1 1/2") cartridge fuses, or a separate barrier protected fuse block must be provided therefore. The fuse block must be wired to the appropriate terminals. The terminal board-fuse block must have plated copper or plated brass, clamp-type pressure terminals of an approved type for "line" connections, to accommodate wire sizes from #12 to #8 A.W.G. The terminals for connection of internal components must either be the screw-clamp or quick disconnect type.
- (o) Photo control Receptacle and Cap. A EEI-NEMA standard three-prong, twist lock receptacle for a photo control must be mounted in the housing with provision for proper positioning of a photo control. The photo control is not required to be furnished, but a shorting cap with E.I.-NEA three-prong plug having line-load prongs shorted together must be provided.
- (p) Reflector Gasket. This gasket must be a silicone rubber, EPR (ethylene propylene rubber), or EPDM (ethylene propylene diene monomer) molded, cavity type gasket of an approved cross-section.
- (q) 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 must 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.
- (r) Finish. The luminaire must have a light gray baked on enamel finish. Color must be Munsell No. 5BG 7.0/0.4 (designated A.S.A. No. 70). An alternate color may be specified, per the order. Surface texture and paint quality will be subject to approval. A color sample may be required.

BALLAST REQUIREMENTS

- 4. (a) General. The integral ballast must be a high power factor, linear type, low loss reactor. It must be designed to furnish proper electrical characteristics for starting and operating a 310 watt, base-up, high pressure sodium lamp at temperature as low as minus 20°F. 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.

- (b) Lamp Operation. The ballast must provide positive lamp ignition at an input voltage of 190 volts. It must operate the lamp over a range of input voltage from 190 to 248 volts without damage to the ballast. It must provide lamp operation within lamp specifications for rated lamp life at input voltage between 204 volts and 248 volts. For the lamp operating voltage range of 90 volts to 140 volts, the lamp wattage must fall within the limits of 210 watts and 390 watts with input voltage ranging from 204 to 248 volts.
- (c) Rating. The ballast must have properly coded wire leads for rated input voltage of 230 volts at 60 cycles, which must drive a nominal 100 volt lamp at 310 watts. The design of input voltage for this ballast will be from +6% to -8% of the nominal voltage (230 volts).
- (d) Lamp Current. The ballast must supply approximately 3.6 amperes to a 310 watt, 100 volt, high pressure sodium lamp during operation, and not more than 5.5 amperes at starting.
- (e) Power Factor. The power factor of the ballast over the design range of input voltages specified above must not be less than 90%.
- (f) Line Current. With nominal input voltage applied, the input current under starting, short circuit or open circuit condition, must not exceed 3.1 amperes rms.
- (g) Lamp Wattage. The ballast must deliver 310 watts to a vertical burning nominal (100 volt) lamp when operating at the nominal (230 volt) input voltage. Wattage input to the nominal (100 volt) lamp must not vary more than a total of 35% over the input voltage design range of 211 volts to 244 volts.
- (h) Ballast Loss. Wattage loss of the ballast must not exceed 31 watts when delivering 310 watts to a nominal (100 volt) lamp at the nominal input (230 volt) voltage. The wattage loss must be measured with a nominal 100 volt lamp "hot" in the fixture.
- (i) Short or Open Circuit. The ballast must be capable of sustaining short circuit conditions without damage to ballast components, including the electronic starter.
- (j) Electronic Starter. The starter component must be comprised of solid state devices capable of withstanding ambient temperatures of 100° C. The starter must provide timed pulsing with sufficient follow through current to completely ionize and start all lamps. Minimum amplitude of the pulse must be 2,500 volts, with a width of one (1) microsecond at 2,250 volts, and must be applied within 20 electrical degrees of the peak of the open circuit voltage wave with a repetition rate of at least once per cycle of the 60 cycle wave. The lamp peak pulse current must be a minimum of 0.2 amps. Proper ignition must be provided over a range of input voltage from 190 to 255 volts. The starter component must be field replaceable and completely interchangeable with no adjustment necessary for proper operation. The starter component must have push-on type electrical terminations to provide good electrical and mechanical integrity and ease of replacement. The starter circuit board must be treated in an approved manner to provide water and contaminant resistant coating.
- (k) Crest Factor. Maximum crest factor must be no greater than 1.65 over the input

voltage range of 211 to 244 volts for a nominal vertical burning lamp.

- (l) Mounting. The ballast components must be mounted and fastened within the luminaire housing 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.
- (m) Wiring. The lampholder and ballast components must be completely wired, with connections made to an approved terminal board. The reactor and capacitor leads must not be smaller than #16 gauge conductors. These must be insulated with an approved class of insulation. All leads must be coded in an approved manner for proper identification. A complete wiring diagram must be displayed at a convenient location on the interior of the luminaires.
- (n) 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.
- (o) Noise Level. The noise level of this ballast must be such that when installed in the luminaire and operating, no objectionable audible noise will be detected from directly beneath the luminaire.
- (p) 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.

PHOTOMETRIC PERFORMANCE

5. (a) Light Distribution. By means of adjustable socket positioning, the luminaire must be capable of providing standard I.E.S. Type II short and medium and Type III medium light distributions. The beam of maximum candlepower must have a minimum value, and must be oriented as follows:

Minimum candlepower per 1,000 lumens = 350
Cone of maximum candlepower = $65^{\circ} \pm 5^{\circ}$ vertical
Plane of maximum candlepower = $75^{\circ} \pm 5^{\circ}$ lateral

Control of light distribution above the angle of maximum candlepower (degree of cutoff) may vary with particular distribution patterns provided.

- (b) Efficiency of the Luminaire. Light flux emitted by this luminaire with a 310 watt, high pressure sodium lamp providing either a Type II or Type III distribution must not be less than the following:

Percent of Lamp Output

Downward - Street Side	43
Downward - House Side	<u>25</u>
	68

- (c) Illumination Data. The minimum, average initial horizontal illumination, and the allowable uniformity from the indicated number of luminaires with 310 watt, 37,000 lumen, high pressure sodium lamps, using the spacing and mounting data shown, must be as follows:

	Type II <u>Distribution</u>	Type III <u>Distribution</u>
No. of Luminaires (Contributing)	2	4
Spacing	85'- one side	85' - Opposite
Street width	42'	70'
Overhang	10'	10'
Mounting height	31'	31'
Average initial horizontal Illumination minimum	2.6 ft.c.	4.0 ft.c.
Uniformity, Avg/Min., Maximum	2:1	2:1

- (d) Brightness Control. Prismatic shielding, or other approved shielding technique, must provide effective luminaire brightness control to both street and house sides such that the average luminance, determined in the manner indicated, must not exceed the values listed below for the specified viewing angles:

Vertical Angle (From Nadir)	Lateral Angle (From 0° Reference Across Street)	Average Luminance Candles/Sq. in.	
		Type II	Type III
55°	180°	35	40
65°	180°	40	46
65°	110°	57	57
65°	250°	57	57
55°	0°	35	37
65°	0°	35	37
65°	45°	62	68
65°	315°	62	68

Average Luminance values must be determined by dividing the candlepower values from the appropriate isocandela diagrams for the specified angles by 100.

- (e) Disability Veiling Brightness (DVB). The total disability veiling brightness (DVB) for the system of luminaires indicated below, and averaged for the two driver positions, must not be greater than 0.300 footlamberts.

Number of luminaires	6
Spacing	85' - 1 side
Street width	42'
Overhand	10'
Mounting Height	31'
Line of Sight	Parallel to Roadway Centerline and 3' from

	Centerline toward the light
Eye Level Above Pavement	3'
Driver Position "A" (along the Line of Sight)	85' In front of 1st light
Driver Position "B" (along the Line of Sight)	42.5' In front of 1st Light.
Perpendicular Distance from the Light Location to the Line of Sight	8'

In evaluating the average, total system DVB, exclude the brightness components for those units where the vertical angle of candlepower emission on the line from the light source to the driver's eye is less than 80°.

PACKING

6. Each luminaire must be securely packed in a suitable carton so that it will not be damaged in handling or shipping. Each carton must be clearly labeled in letters not less than 3/8" in height with the legend: "310 WHPS CRIMEFIGHTER LUMINAIRE". The manufacturer's name, date of manufacture, City commodity code, and the contract number must also be clearly marked on the carton.

LUMINAIRE: FOR 1,000 WATT, HIGH PRESSURE SODIUM LAMP; IES TYPE II/III DISTRIBUTION

SUBJECT

1. This specification states the requirements for a street lighting luminaire, with integral constant wattage ballast and electronic starter, to provide base-down to horizontal burning of a 130,000 lumen 1,000 watt, type LU1000/BD high pressure sodium lamp. The luminaire is to be mounted 30 feet above the pavement, attached to the end of a mast arm fabricated of two-inch steel pipe.

GENERAL

2. (a) Information Required. Each bidder must submit with his proposal the following information relative to the luminaire he proposes to furnish:
 1. Outline drawing.
 2. Complete description and weight.
 3. Candlepower distribution curve showing the light distribution in the 70 degree cone and in a vertical plane through the maximum beam.
 4. Isolux curves for the various socket positions.
 5. Utilization efficiency charts.
 6. Luminaire efficiency.
 7. Effective projected area (EPA) in square feet.
 8. Manufacturer's name and catalog designation.
 9. Electronic copy of IES formatted photometric curves.
- (b) Sample. One completely assembled luminaire of the manufacture intended to be intended to be furnished, must be submitted to the Bureau of Electricity within

fifteen (15) business days upon receipt of such a request from the Chief Procurement Officer.

- (c) Assembly. Each luminaire must be delivered completely assembled, wired, and ready for installation. It will consist of the aluminum housing, aluminum reflector, glass refractor, refractor holder, lamp holder assembly, ballast components, gaskets, slip fitter, and all necessary hardware. Lamps and fuses need not be included.
- (d) Warranty. The manufacturer must warrant that the performance and construction of the luminaire meets the requirements of this specification. The manufacturer must warrant all parts, components, and appurtenances against defects due to design, workmanship, or material developing within a period of one year after the luminaire has been placed in service. This will be interpreted particularly, but not exclusively, to mean compatible performance of the ballast with lamps of various manufacturer, failure of any ballast component, loss of reflectivity of the reflector, and discoloration or fogging of the refractor. Any luminaire or part thereof, not performing as required, or developing defects within this period must be replaced by the manufacturer without expense to the City.

CONSTRUCTION

- 3. (a) Housing. The housing must be a precision molded aluminum die casting. The housing must be able to withstand the stress and strains associated with the environment; this includes rain, snow, ice, wind, and vibrations.
- (b) Slip Fitter. The slip fitter must be suitable for attachment over the end of a two (2) inch steel pipe with an approved means of clamping it firmly in place. It must have a built-in pipe stop. The slip fitter must be designed to permit adjustment of not less than 3 degrees above and below the axis of the mounting bracket. The slip fitter must contain an approved shield around the pipe entrance to block entry of birds or insects.
- (c) Lamp Holder Assembly. The lamp holder must be fully adjustable to accurately position the lamp. It must be a mogul base, porcelain enclosed socket having lamp grips, and must be a highly quality commercial product. The socket support bracket must provide both horizontal and vertical adjustments to achieve a broad range of light distribution patterns. Each adjustment position must be clearly marked, and the socket must be assembled in the optical system, in a manner which completely provides a sealed, moisture and dust tight optical system.
- (d) Reflector. The reflector must be made of spun aluminum and polished to a highly specular "Alzak process" finish, with suitable means for attachment to the housing. It will be of such design as to give proper redirection of the light striking it with minimum reflection through the outer bulb of the lamp and will distribute the reflected light uniformly over the refractor surface. It will be so designed that voltage rise within the lamp, at rated line and open circuit voltage, will not exceed 25 volts.
- (e) Refractor. The refractor must be pressed, crystal clear, heat-resistant, borosilicate 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 reflection and refraction the light from the lamp to produce vertical and lateral light distribution patterns conforming substantially with IES Type III and Type IV light distributions. For diffusion of the light and good appearance, a pattern of continuous and adjoined flutes or configurations must be pressed on the outside of the surface. In the event the refractor can fit into its holder in two positions, the refractor must be clearly embossed with the designations "street side" and "house side", to insure proper orientation.

- (f) Refractor holder. The refractor holder must be hinged to the luminaire housing and must open approximately 90 degrees to allow servicing of the lamp and reflector, as well as access to the ballast components. The refractor must be securely held in the refractor holder. In the closed position, the refractor holder will cause the refractor to seat against the reflector gasket. The refractor holder must permit simple removal and replacement of the refractor without the use of tools. The hinge must prevent the refractor holder from disengaging and dropping in case it should swing open.
- (g) Latch. An approved latch must be provided for latching the refractor holder to the housing. The latch must be located opposite a suitable hinge, and in conjunction with the hinge will compress the gasket between the reflector and the refractor. The latch must be a firm-gripping, easy opening, tool-less, single action, positive latch type.
- (h) Gaskets. Wherever necessary, in order to make a completely dust proof optical assembly, gaskets of silicone rubber, or other approved material must be provided.
- (i) Hardware. All machine screws, locknuts, pins, and set screws necessary to make the firm assembly, and its secure attachment to the mast arm, must be furnished in place. All hardware must be stainless steel, copper silicon alloy or other non-corrosive metal, and where necessary will be suitably plated to prevent electrolytic action by contact with aluminum.
- (j) Fiberglass Tubing. Two lengths of fiberglass tubing with silicone varnish coating meeting requirements of the National Electrical Manufacturer's Association insulation classification HC-2, Size 2 (.263" ID) must be provided to permit proper thermal insulation of conductors ("LINE" leads) within the luminaire. They must be sufficiently long to extend from the terminal block to a point 6 inches beyond the end of the slip fitter.
- (k) Terminal block. A terminal board of high grade molded plastic or glazed porcelain, of the barrier of safety type, must be mounted within the housing in a readily accessible location. It will provide all terminals needed to completely pre-wire all luminaire components. The terminal block must have plated copper or plated brass, clamp type pressure terminals of an approved type for "line" connections, to accommodate wire sizes from #12 to #8 AWG. The terminals for connection of internal components must either be the screw-clamp or quick disconnect type.
- (l) Filter. The optical system must contain a charcoal "breathing" filter, of adequate size to provide effective filtering of particulate and gaseous contaminants.

- (m) Finish. The luminaire must have a light gray baked on enamel finish. The gray color will be Munsell No. 5BG 7.0/.4 (designated A.S.A. No. 70). Other colors may be required as approved by the Commissioner.

BALLAST AND COMPONENTS

4. (a) General. The integral ballast must be a constant wattage autotransformer (CWA). It must be designed to furnish proper electrical characteristics for starting and operating a 1000 watt, type LU high pressure sodium lamp at temperatures as low as -40° Fahrenheit. 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 Model #71A8793 or equal.
- (b) Lamp Operation. The ballast must provide positive lamp ignition at an input voltage of 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 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 specifications for rated lamp life at input voltages between 198volts and 218 volts for the 208 volt tap, and between 228 volts and 252 volts for the 240 volt tap.
- (c) Rating. The ballast must have non-fading, color coded wire leads for rated input voltage of 208 volts or 240 volts at 60 cycles, which must drive a nominal 250 volt lamp at 1000 watts. The design range of input voltage for this ballast must be from +6% to -8% of the nominal voltage.
- (d) Lamp Current. The ballast must supply nominal 4.7 amperes to a 1000 watt, 250 volt high pressure sodium lamp, in accordance with the lamp manufacturer's recommendations, during operation and a maximum of 7.0 amperes at starting.
- (e) Lamp Voltage. The lamp will operate at a nominal value of 250 volts. The voltage range after 100 burning hours will be between 210 and 275 volts. The maximum lamp voltage will be 350 volts.
- (f) Power Factor. The power factor of the ballast over the design range of input voltages must not be less than 90%.
- (g) Line Current. With nominal input voltage applied, the input current under starting, short circuit, or open circuit conditions, must not exceed the lamp manufacturer's recommendations.
- (h) Lamp wattage. The ballast must deliver 1000 watts to a horizontal burning nominal 250 volt lamp when operating at the nominal input voltage. The permitted operating range for the rated lamp life is between 750 watts and 1200 watts.
- (i) Ballast Loss. Wattage loss of the ballast must not exceed 103 watts at the nominal input voltage. The wattage loss will be measured with a nominal 250 volt lamp "hot" in the fixture.

- (j) Short or open circuit. The ballast must be capable of sustaining short or open circuit conditions for extended periods without damage to ballast components, including the electronic starter.
- (k) Ignitor. The ignitor must be of a design similar to Payne-Sparkman Manufacturing Inc., 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 of 3000 volts. The ignitor must be totally epoxy encapsulated in a metal can and must be compatible 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.
- (l) Crest Factor. The current crest factor must not be greater than 1.8 nominal input voltage for a nominal horizontal burning lamp.
- (m) Capacitor. The capacitor must be an AC voltage, paper, non-PCB impregnated, 80° Centigrade 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° Centigrade after ten (10) hours of continuous operation of the luminaire in an ambient temperature of 30° Centigrade.
- (n) 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 field installation and mounted on a pole at a 30' light center height.
- (o) 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.
- (p) 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 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 voltage taps on the ballast.
- (q) Component Mounting.
 - 1. Modular Construction. All electrical components must be securely mounted to a modular plate in such a manner that individual components can be easily replaced and maintained. 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 must 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 maintenance or replacement

PACKING

5. (a) Packing. Each luminaire assembly must be packed in a suitable carton so secure that it will not be damaged in shipping or handling.
- (b) Marking. Each carton must be clearly labeled on the outside in letters not less than three-eighths inch tall (3/8) with the legend: " LUMINAIRE, 1000 WHPS, IES II/III", the appropriate City Commodity Code, the manufacturer's name, the date of manufacturer, and the contract number under which the luminaire is being furnished.

LUMINAIRE: WITH INTEGRAL BALLAST FOR 400 WATT, HIGH PRESSURE SODIUM LAMP; I.E.S. TYPE II/TYPE III DISTRIBUTION

SUBJECT

1. This specification states the requirements for a street lighting luminaire, with integral ballast and electronic starter, to provide base down to horizontal burning of 50,000 lumen, 400 watt, Type LU400 high pressure sodium lamp.

GENERAL

2. (a) Information Required. Each bidder must submit with his proposal the following information relative to the luminaires he proposes to furnish:
 1. Outline drawing.
 2. Complete description and weight.
 3. Candlepower distribution curve showing the light distribution in the 70° degree cone and in a vertical plane through the maximum beam.
 4. Isolux curves for the various socket positions.
 5. Utilization efficiency charts.
 6. Luminaire efficiency.
 7. Projected area in square feet.
 8. Manufacturer's name and catalogue designation of the luminaire.
 8. IES formatted photometric curve in electronic format.
- (b) Sample. One completely assembled luminaire of the manufacture intended to be furnished, must be submitted upon request of the Chief Procurement Officer within fifteen (15) business days of such request.

- (c) Assembly. Each luminaire must be delivered completely assembled, wired, and ready for installation; without the lamp and fuses. It must consist of aluminum housing, aluminum reflector, glass refractor, refractor holder, lamp holder assembly, terminal board-fuse block, ballast-door panel, ballast components, gaskets, slip fitter, and all necessary hardware.
- (d) 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 one (1) year after the luminaire has been placed in service. 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 reflecting surface, and discolorations or fogging of the refractor impairing the transmission of light. Any luminaire or part thereof, not performing as required, or developing defects within this period must be replaced by the manufacturer without expense to the City.

CONSTRUCTION

- 3. (a) Weight and Area. The net weight of this luminaire with ballast must be not more than 60 pounds. The projected area must not exceed 3.1 square feet.
- (b) Housing. The housing must be a precision molded aluminum die casting. The wall thickness must be substantial and adequate to withstand the strains likely to be imposed on the housing when installed and in service.
- (c) Slip Fitter. The slip fitter must be suitable for attachment over the end of a two (2) inch steel pipe with an approved means of clamping it firmly in place, and must provide a built-in pipe-stop. It may be integral with, or may be attached to, the housing. The slip fitter must be designed to permit adjustment of not less than three (3) degrees above and below the axis of the mounting bracket. The slip fitter must contain an approved shield around the pipe entrance to block entry of birds.
- (d) Lamp Holder Assembly. The lamp holder must be fully adjustable to accurately position the lamp. It must be a mogul, porcelain enclosed socket having lamp grips, and must be high quality commercial product. The socket support bracket must provide both horizontal and vertical adjustments to achieve a broad range of light distribution patterns. Each adjustment position must be clearly marked, and the socket must be positively secured in each position. The lamp holder and its bracket must be assembled in the optical system, in a manner which provides a completely sealed, moisture and dust tight optical system.
- (e) Reflector. The reflector must be made of aluminum and polished to a highly specular "Alzak process" finish with suitable means for attachment to the housing. It must be of such design as to give proper re-direction of the light striking it with minimum reflection through the outer bulb of the lamp and must distribute the reflected light uniformly over the refractor surface.
- (f) Refractor. The refractor must 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 reflection and refraction the light from the lamp to produce vertical and lateral light distribution patterns conforming substantially with both I.E.S. Type II and Type III light distributions. For diffusion of the light and good appearance, a pattern of continuous and adjoined flutes or configurations must be pressed on the outside surface. In the event the refractor can fit into its holder in two (2) positions, the refractor must be clearly embossed with the designations "Street side" and "House side" to insure proper orientation.

- (g) Refractor Holder. The refractor holder must be hinged to the luminaire housing and must open approximately 90 degrees to allow servicing of lamp and reflector. The refractor must be securely held in the refractor holder. In the closed position the refractor holder must cause the refractor to seat against the reflector gasket. The refractor holder must permit simple removal and replacement of the refractor without the use of tools. The hinge must prevent the refractor holder from disengaging and dropping in case it should swing open.
- (h) Latch. An approved latch must be provided for latching the refractor holder to the housing. The latch must be located opposite a suitable hinge, and in conjunction with the hinge must compress the gasket between the reflector and refractor. The latch must be a firm-gripping, easy opening, single action, positive latching type requiring no tools.
- (i) Ballast Door-Panel. The ballast components must be completely assembled and mounted on a die-cast aluminum door-panel. The door-panel must be hinged to the luminaire housing, suitably latched and fastened at the closing end; and it must be rapidly and simply removable. The hinge and fastening devices must be captive parts which will not become disengaged from the door panel.
- (j) Gaskets. Wherever necessary, in order to make a completely dustproof optical assembly, gaskets of silicone rubber or other specifically approved material must be provided. The reflector gasket must fit around and over the flange of the reflector.
- (k) Hardware. All machine screws, locknuts, pins and set screws necessary to make a firm assembly, and for its secure attachment to the mast arm, must be furnished in place. All hardware must be of stainless steel, copper silicon alloy or other non-corrosive metal, and where necessary must be suitably plated to prevent electrolytic action by contact with aluminum.
- (l) Fiberglass Tubing. Two lengths of fiberglass tubing with silicone varnish coating meeting requirements of National Electrical Manufacturers' Association insulation classification HC-2, Size 2 (0.263" I.D.), must be provided to permit proper thermal insulation of conductors ("LINE" leads) within the luminaire. They must be sufficiently long to extend from the terminal block to a point 6 inches beyond the end of the slip fitter.
- (m) Terminal Board-Fuse Block. A terminal board of molded phenolic plastic of the barrier type must be mounted within the housing in a readily accessible location. It must provide all terminals needed to completely prewire all luminaire components. The terminal board must either incorporate a barrier isolated section with fuse clips

to take two "small-dimension" (13/32" x 1 1/2") cartridge fuses, or a separate barrier protected fuse block must be provided therefor. The fuses are not required to be furnished with this luminaire. The fuse block must be wired to the appropriate terminals. The terminal board-fuse block must have plated copper or plated brass, clamp-type pressure terminals of an approved type for "line" connections, to accommodate wire sizes from #12 to #8 A.W.G. The terminals for connection of internal components must either be the screw-clamp or quick disconnect type.

- (n) Filter. The optical system must contain a charcoal "breathing" filter, of adequate size to provide effective filtering of particulate and gaseous contaminants.
- (o) Finish. The luminaire must have a baked on enamel finish. Surface texture and paint quality will be subject to approval. Color must be gloss black or gray Munsell No. 5BG 7.0/0.4 (designated A.S.A. No. 70) as specified in the order. A paint chip must be submitted as a sample upon request.

BALLAST

- 4. (a) General. The integral ballast must be a voltage tapped, high power factor, linear type, low loss reactor. It must be designed to furnish proper electrical characteristics for starting and operating a 400 watt high pressure sodium lamp at temperatures as low as minus 40°F. 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.
- (b) Lamp Operation. The ballast must provide positive lamp ignition at an input voltage of 191 volts. It must operate the lamp over a range of input voltage from 191 to 220 volts without damage to the ballast for the 208 volt tap connection and 220 to 254 volts for the 240 volt tap connection. It must provide lamp operation within lamp specifications for rated lamp life at input voltage between 198 volts and 218 volts for the 208 volt tap connection and between 228 volts and 252 volts for the 240 volt tap connection.
- (c) Rating. The ballast must have properly coded wire leads for taps at rated input voltage of either 208 or 240 volts at 60 cycles, which must drive a nominal 100 volt lamp at 400 watts. The design range of input voltage for this ballast must be from +6% to -8% of the nominal voltage.
- (d) Lamp Current. The ballast must supply approximately 4.7 amperes to a 400 watt, 100 volt high pressure sodium lamp during operation, and not more than 7.0 amperes at starting.
- (e) Power Factor. The power factor of the ballast over the design range of input voltages specified above must not be less than 90%.
- (f) Line Current. With nominal input voltage applied, the input current under starting, short circuit or open circuit condition, must not exceed 4.7 amperes rms.
- (g) Lamp Wattage. The ballast must deliver 400 watts to a nominal 100 volt lamp when operating at the nominal input voltage. Wattage input to the nominal lamp

must not vary more than a total of 37% over the input voltage design range of 191 volts to 254 volts with the supply connected to the proper ballast tap.

- (h) Ballast Loss. Wattage loss of the ballast must not exceed 43 watts when delivering 400 watts to a nominal lamp at the nominal input voltage of 208 or 240 volts.
- (i) Electronic Starter. The starter component must be comprised of solid state devices capable of withstanding ambient temperatures of 100°C. The starter must provide timed pulsing with sufficient follow-thru current to completely ionize and start all lamps. Minimum amplitude of the pulse must be 2,500 volts, with a width of one (1) microsecond at 2,250 volts, and must be applied within 20 electrical degrees of the peak of the open circuit voltage wave with a repetition rate of once each half cycle of the 60 cycle wave. The lamp peak pulse current must be a minimum of 0.5 amps. Proper ignition must be provided over a range of input voltage from 191 to 254 volts. The starter component must be field replaceable and completely interchangeable with no adjustment necessary for proper operation. The starter component must have push-on type electrical terminations which must provide good electrical and mechanical integrity with ease of replacement. The starter circuit board must be treated in an approved manner to provide a water and contaminant resistant coating.
- (j) Crest Factor. Maximum crest factor must be no greater than 1.65 over the input voltage range of 191 to 254 volts for a nominal vertical burning lamp.
- (k) Mounting. The ballast components must be mounted and fastened on the luminaire ballast door panel 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.
- (l) Wiring. The lamp holder and ballast components must be completely wired, with connections made to a terminal board that is suitable for both copper or aluminum supply conductors to provide the 208/240 volts tap connections. The reactor and capacitor leads must not be smaller than #16 gauge conductors. These must be insulated with an approved 125°C insulation. All leads must be coded in an approved manner for proper identification. A complete wiring diagram must be displayed at an easy to read location on the interior of the luminaire.
- (m) Capacitor. The capacitor must be a non-PCB, a-c power type. The capacitor can must be coated with a moisture resisting paint, or must be fabricated of non-corrosive material.
- (n) Ballast. The ballast must be tapped linear reactor device incorporating a molded polyester-glass bobbin structure having a precision wound, insulated, magnetic wire coil with bobbin mounted push-on type electrical terminations. These terminations must provide good electrical and mechanical integrity as well as easy ballast replacement. The ballast must be treated in an approved manner to provide electrical and mechanical protection.
- (o) Wiring Connection. The ballast panel wiring must be "plug" connected to lamp and line leads for easy disconnect in removing the ballast.

PACKAGING

5. (a) Packing. Each luminaire assembly must be packed in a suitable carton so secure that it must not be damaged in shipment and handling.
- (b) Marking. Each carton containing a luminaire must be clearly marked on the outside in letters not less than three-eighths (3/8) inch tall with the legend: "LUMINAIRE W/BALLAST, 400 WATT HP-SODIUM, IES TYPE II/TYPE III", the appropriate City Commodity Code Number, the name of the manufacturer, the date of manufacture, and the contract number under which the luminaire is furnished.

PEDESTAL WITH BASE: ALUMINUM, FOR TRAFFIC SIGNALS

SUBJECT

1. The specification states the requirements of an aluminum pedestal and base with handhole and door for supporting a traffic signal.

GENERAL

2. (a) Specifications. The pedestal base must conform to the requirements herein stated, to the specifications and methods of test of the American Society for Testing and Materials (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 Streets and Sanitation. It is an integral part of this specification cooperating to state the necessary requirements.
- (d) Workmanship. All pedestal bases must be free of casting flaws and must have neat, smooth exterior surfaces. All holes must be accurately located and drilled. The bottom surface of the base must be ground smooth.
- (e) Sample. One complete pedestal of the manufacture intended to be furnished must be submitted within fifteen (15) business days upon receipt of a request from the Chief Procurement Officer.

DETAIL REQUIREMENTS

3. (a) Design. The pedestal base must conform to the design shown on Drawing Number 526. All bases must be of the same dimensions, and all doors must be interchangeable.
- (b) Base. The base must be cast of aluminum alloy 319 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) Welding. The welds must be made by the inert gas metal welding process. Filler wire must conform to chemical composition requirements of AWS Alloy Number A5.10-69.

PAINING

4. (a) Facility. All surface preparation and painting must be done indoors at a single facility specifically set up for painting purposes.
- (b) Surface preparation. Exterior surfaces must be prepared by solvent cleaning per SSPC – SP 1 (Surface Preparation Specification 1). The solvent used must be recommended for aluminum surfaces, such as Sherwin Williams MEK #R6K10. The solvent must be used according to the manufacturer's instructions to remove all oil, grease, dirt, and contaminants.
- (c) Primer Coat.
1. Within one hour of surface preparation, surfaces must be primed using a primer specifically recommended for aluminum surfaces such as Sherwin Williams Industrial Wash Primer #P60G2.
 2. Aluminum surface temperature must be at least 60° Fahrenheit and relative humidity must be less than 80% at time of primer application.
 3. A minimum wet thickness must be applied to provide a 2mil dry thickness.
 4. The primer must be dry for a period of 24 hours after which a second primer coat must be applied. The second coat must also have a dry thickness of 2 mils.

- (d) Finish Coat.
1. The primer must be dry for a period of 24 hours before a finish coat can be applied.
 2. The finish coat must be a polyurethane enamel specifically recommended for use over a primed aluminum surface.
 3. Two coats of finish must be applied. Each must have a dry thickness of 1.5 mils.
 4. Color will be gloss black unless otherwise specified. Paint samples must be approved before painting can commence.
- (e) Alternate Coating Methods. Alternate coating methods, such as electrostatic powder coating, may be considered. However, no coating method will be accepted without the Commissioner's or his representative's approval.
- (f) Durability. The paint coating must be capable of passing 1000 hours of salt spray exposure as per ASTM B117 in a 5% NaCl (by weight) solution at 95° Fahrenheit and 95% relative humidity without blistering. Before testing, a coated aluminum panel must be scribed with an "X" down to bare metal.
- (g) Coating Measurement. Measurement of coating thickness must be done in accordance with SSPC – Pa 2-73T, "Measurement of Dry Paint Thickness with Magnetic Gauges".

PACKING

5. Each pedestal must be individually wrapped to prevent damage to the paint surface. Each pedestal must be suitably packed or blocked to prevent damage during shipment and handling.

POLE: ANCHOR BASE, 3 AND 7 GAUGE, TAPERED TUBULAR STEEL, WITH HANDHOLE ENTRY

SUBJECT

1. This specification states the requirements for tapered, tubular, 3 gauge and 7 gauge steel anchor base poles with mast arm supports. They will support street light luminaires and/or traffic signal mast arms and will be served by underground cables.

GENERAL

2. (a) Specifications. The poles must conform in detail to the requirements herein stated, and to the Specifications and Methods of Test of the American Society for Testing and Materials cited by ASTM Designation Number of which the most recently published revisions will govern.
- (b) Acceptance. Poles not conforming to this specification will not be accepted.

- (c) Bidders Drawings. Bidders must submit with their bids detailed scale drawings of the mast showing actual dimensions, details, and welds. Shop drawings must be original engineering drawings created by the manufacturer. The drawings must show every dimension necessary to show how all parts will fit each other and be properly held in assembly. These drawings must also be submitted in electronic format, preferably Microstation 95, if so requested by the City.
- (d) Drawings. The drawings mentioned herein are drawings of the Department of Streets and Sanitation being an integral part of this specification cooperating to state necessary requirements.
- (e) Sample. If requested by the Chief Procurement Officer, one completely assembled anchor-base pole of the manufacture intended to be furnished, must be submitted for review within fifteen (15) business days of receiving the request.
- (f) Warranty. The manufacturer must warrant the performance and construction of the light poles to meet the requirements of this Specification and must warrant all parts, components, and appurtenances against defects due to design, workmanship, or material developing within a period of five years after the light poles have been delivered. This will be interpreted particularly to mean structural or mechanical failure of any element or weld, or failure of any portion of the painting system. The warranty must be furnished in writing guaranteeing material replacement including shipment, free of charge to the City. The Commissioner will be the sole judge in determining which replacements are to be made and the Commissioner's decision will be final.

STANDARDS

- 3. (a) Assembly. Each anchor base pole must consist of a steel mast with handhole entry, entry door with machine screws, grounding nut, mast base plate, top cap for mast, two (2) mast arm supports, bolt covers, and all necessary hardware required for complete assembly of these parts, ready for assembly, without special tools.
- (b) Interchangeability. Members of each pole type must be mutually interchangeable for assembly, so that no reworking will be required to make any member fit properly in the place of any other similar member of any other similar pole.
- (c) Design. Each pole type must conform in design and dimensions to the pertinent drawing(s) listed in Table "A".

MASTS

- 4. (a) Mast Size. The outside diameters of the mast of each pole type must be as listed in Table A. The mast must be tapered at 0.14 inches per foot.
- (b) Material. The mast must be fabricated from one length of No. 3, No. 7, or No. 11 Standard gauge steel meeting the material requirements of ASTM A606 for low alloy high strength coil steel, which, after fabrication, must possess an ultimate tensile strength of not less than 70,000 psi and a yield strength of not less than 60,000 psi, in accordance with ASTM A595, Grade C. Chemistry of the steel must be such as to insure resistance to atmospheric corrosion superior to that of ordinary copper bearing steel. Material certification is required. Manufacturer's steel meeting the specified physical and chemical requirements, and approved by

the Commissioner, will be accepted.

- (c) Fabrication. The mast must be fabricated with not more than one (1) longitudinal weld. The weld must be ground smooth so that it is virtually invisible. There must be no lateral welds in the masts other than where the masts are welded to the steel bases. Each mast must be straight and centered on its longitudinal axis. Each mast must be formed on a mandrel and worked to form a round cross-section. The completed, unpainted masts must have smooth external surfaces free from protuberances, dents, cracks or other imperfections marring their appearance.
- (d) Base. The mast base must be a steel plate, of low alloy, high strength steel as noted in Par. 4 (b).

Plate Base. The base plate for each pole type must be as listed in Table "A". It must be fabricated from the same ASTM A606 low alloy, high strength steel as is used for the mast. After fabrication the steel must meet the requirements of ASTM A588. The mast must be inserted into the base to a maximum depth which will still allow for an adequate weld to be made between the bottom of the mast and the plate. A circumferential weld must be made between the mast and the base at both the top and underside of the plate. Non-metallic removable bolt covers which completely cover the anchor bolts and nuts must be provided. The covers must be attached with stainless steel screws coated with a non-seizing compound, or another type of non-seizing fastener, as approved by the Commissioner. The covers must enclose the anchor bolts and be secured in an approved manner. The base must be attached to the mast so that the bearing surface of the base is at right angles to the longitudinal axis of the mast. The vertical center line of the seam must be positioned so that no welds for the simplex attachments or the handhole opening will go through the seam.

Anchor Rod Openings. All anchor rod openings for each pole type must have a width as listed in Table "A". Each opening must be sized to have a circumferential slot length equal to 15 degrees of the circumference.

- (e) Mast Arm Support Plates. The mast arm support plates will be made of cast steel conforming to the requirements for Grade 65-35 cast steel of ASTM A27, or equivalent, subject to approval. They must neatly fit the external surface of the mast. The upper mast arm support plate must have a hollow protuberance, the hole of which must be approximately equivalent to two (2) inches in diameter, extending into the interior of the pole providing a smooth surface for the lamp cables to rest upon. The mast arm support plates must be designed so that they will carry the mast arm and hold it in the proper position for fastening the mast arm to the mast. The design of the mast arm support plates must be a two (2) bolt type as shown on Drawing No. 659.
- (f) Provision for Ground. A 1/2-13 square nut must be welded to the inside of the mast on the handhole entry frame for a ground connection.
- (g) Entry. A vertical doorframe carrying a removable door providing access to the interior of the mast must be welded into a close fitting opening centered approximately 15 inches above the bottom of the base. The doorframe must be formed and welded of steel with a cross section of two and one-quarter (2-1/4)

inches wide by one-quarter (1/4) inch thick so as to adequately reinforce the opening of the mast. The internal horizontal clearance of the doorframe must be four and three-quarter (4-3/4) inches; its internal vertical clearance must be seven (7) inches. Its upper and lower ends must be semi-circular meeting its straight sides tangentially. The radius of this opening must be two and three-eighths (2-3/8) inches. The vertical center line of the entry must be at a right angle clockwise from the vertical center line of the mast arm supports. The frame must have two welded tabs; one at the top and one at the bottom of the door frame. These tabs must be drilled and tapped to accept a 1/4-20 UNC screw. The top hole must be located 13/16 of an inch from the top of the opening. The bottom hole must be located 13/16 of an inch from the bottom of the opening. The 1/4-20 machine screws must be stainless steel with hex heads, meeting the requirements of ASTM A193. The screws must be treated with a compound to prevent seizing. Other non-seizing types of screws and fasteners may be considered. An alternate method of attachment consisting of a removable hinge on the bottom with a screw connection at the top may be considered. (The above requirements apply to all pole masts except those with a 10 inch bolt circle. Poles with 10 inch bolt circles must have handhole openings of 3" by 5". All other requirements apply.)

- (h) Door. The removable door must be formed of sheet steel approximately one-eighth (1/8) inch thick. It must be flat or dished depending upon the pole type, and fit the doorframe closely so that it will stay in proper position even if its locking screws are slightly loosened. The door must be drilled top and bottom to accept the 1/4-20 hex head machine screws, which will fasten the door to the doorframe. A half-circle piece of steel must be welded by the screw opening, to allow only a socket wrench to be used. All doors must be interchangeable. An alternate method of attachment using an internal hinge at the bottom of the door with a screw at the top of the door will be considered. Any alternate method will be subject to approval by the Commissioner or his duly authorized representative.
- (i) Locking Device. Any other door locking device, other than the one outlined above in (g) and (h), must be approved by the Commissioner or his duly authorized representative.
- (j) Tag. To each pole must be attached immediately below the handhole, by mechanical means and not by adhesive, a stainless steel tag with a stamped or embossed legend which must include the pole outside diameter at the base, the overall length, and the gauge; i.e., 12.5" X 34'-6" X 3 gauge.
- (k) Structural Requirements. The mast must be manufactured in accordance with AASTHO's 1994 version of the "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals". The shaft and base assembly must be designed to meet AASTHO's 1994 criteria for 80 MPH wind loading with a 30% gust factor. The poles must be designed appropriately for Chicago applications for both street lighting and traffic signal applications, including signal mast arms.

TOP

- 5. (a) Design. The mast top must be essentially conical with a globe-shaped upper-end and having a minimum wall thickness throughout of not less than 1/4 inch. The

cone portion must meet the skirted portion of the top in a smooth filet, the skirt must enclose the top 7/8" inches of the mast. Three stainless steel, or other similar approved material, set screws not less than 3/4 inches long must be equally spaced in tapped holes around the skirt and must hold the top securely in place atop the mast. The design of the top must be similar to one shown on Drawing #11420A.

- (b) Material. The top must be aluminum alloy 356-F per ASTM B108. It must have smooth surfaces, neat edges and corners and be free from fins, holes or other casting flaws. Non-metallic tops may be substituted if approved by the Commissioner.
- (c) Finish. Tops must be painted as herein specified.

HARDWARE

- 6. All the hardware necessary to complete the assembly of the pole must be furnished. All hardware will be as specified elsewhere in these specifications. Hardware not specified elsewhere must be stainless steel meeting the requirements of ASTM A193, or equal corrosion-resistant non-seizing metal, or a non-metallic material subject to approval by the Commissioner.

WELDING

- 7. (a) General. Every welded joint must be made in conformity with the proper interpretation of the standard welding symbols of the American Welding Society as indicated on the drawings; however, each bidder must submit with his proposal a drawing showing the sizes and types of welds, must state the type of electrode, and must describe the welding methods, he proposes to use in fabricating the pole.
- (b) Testing. Welds must be inspected for penetration and soundness of the welds by the magnetic particle inspection method or by radiography. Acceptance or rejection will be governed by the same conditions as in Section 9. If the magnetic inspection process is to be used, the dry method with the direct current must be employed. All transverse welds must be magnetized by the "prod" (Circular magnetization) method. Longitudinal welds may be magnetized by either circular or longitudinal magnetization.

PAINTING

- 8. (a) Oil and Grease Removal. All metal surfaces must be washed with an alkaline detergent to remove any oils or grease.
- (b) Metal Cleaning. All exterior metal surfaces must be cleaned by blasting with a combination of shot and grit to remove all dirt, mill scale, rust, corrosion, oxides and foreign matter and provide a "near white" surface in accordance with SSPCS-SP10. Included in this process must be the interior base section of the mast to a minimum height of twelve (12) inches.
- (c) Chemical Pretreatment. The cleaned metal surfaces must then be treated with a hot, pressurized iron phosphate wash and must be dried by convection heat.
- (g) 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.

- (h) Finish Coat. All exterior surfaces are to be subsequently coated with Tnemec Endura-Shield II 1074 aliphatic acrylic polyurethane to a minimum dry film thickness of 3.0 mils (.003"). The coating must be airless-spray applied and cured in a gas-fired convection oven by heating the steel substrate to between 150° Fahrenheit and 220° Fahrenheit.
- (f) Interior Coat. Interior surfaces are to be coated with red oxide rust inhibitive alkyd primer to a dry film thickness of 1.5 mils.
- (g) Durability. Both the exterior and interior coats must be capable of passing 1,000 hours of salt spray exposure as per ASTM B117 in a five percent (5%) NaCl (by weight) solution at 95°F and 95% relative humidity without blistering. Before test, the panel must be scribed with an "X" down to bare metal.
- (h) Coating Measurement. Measurement of coating thickness must be done in accordance with SSPC-Pa 2-73T, "Measurement of Dry Paint Thickness with Magnetic Gauges," except that the lowest "single spot measurement" in an area of two square inches must be not less than 5.5 mils.
- (i) Color. Color must be gloss black unless otherwise noted in the order. A color sample must be submitted for approval prior to fabrication.
- (j) Alternate Methods. Alternate painting methods may be reviewed and tested on a case by case basis. However, no coating method will be accepted unless the Commissioner judges such alternate to be equal to the coating herein specified.

MAST TEST

- 9. (a) General. All completed masts must be available for testing for maximum deflection and set. The masts must meet the structural requirements of Section 4(k). Unless specifically authorized in writing, all tests must be made at the works of the manufacturer. The tests must be witnessed and certified by an engineer from the Bureau of Electricity. If an engineer from the Bureau is not available, an independent consultant, approved by the Bureau, must witness and certify the tests. There will be no cost to the City for this. A record of every test must be made and a certified copy of the test record must be submitted to the Commissioner before the masts are shipped.
- (b) Lot. Tests for welds, deflection and set of the mast and of the mast arm supports must be made upon three (3) masts of the first fifty (50) in every order. An additional one (1) mast must be tested for each additional fifty (50) masts in the order. The selection of masts for testing must be random from the entire completed lot. If any of the masts in any lot fail to meet the test, an additional three (3) masts of the same lot must be tested. If any of these masts fail to meet the test requirements, the entire lot will be subject to rejection, except that the manufacturer may subject each mast in the lot to the test, and those which fulfill the requirement

will be accepted. After testing, each base weld must be inspected by the magnetic particle method to determine that the welds have not been affected.

- (c) Mast Requirements. With base rigidly anchored, a test load as indicated in Table A must be applied at a point approximately two feet (2'0") from the free end. The load must be applied at right angles to the center line of the mast and in the same vertical plane. The deflection must not be greater than that indicated in Table A. Within one (1) minute after the test load is released, measurement must be made of the set taken by the mast. This set must not be greater than that indicated in Table A. The deflection measurement device must be reset to zero and the test load must be reapplied. The deflection must not change from the deflection noted in the first test by more than $\pm 5\%$. No measurable set must be noted within one (1) minute after test load is released.
- (d) Mast Arm Support (simplex) Requirements. With an appropriate mast arm firmly attached to the mast, a test load of 300 pounds must be applied to the mast arm as a side pull at a point seven (7) feet from the mast. After the test, the mast arm support welds on the mast must be tested by the magnetic particle method to determine that they have not been affected.
- (e) The contractor must include in his bid, the cost of travel, food and lodging for one (1) engineer. Travel for 150 miles or greater must utilize a major airline. Lodging accommodations must be equal to those provided at a Holiday Inn. The engineer must be given ten (10) working days notice of travel arrangements.

PACKAGING

- 10. (a) General. The poles must be shipped in twelve (12) pole bundles. Each pole must be individually wrapped so that the pole can be bundled for shipping and unbundled for delivery to the City without damaging the pole or its finish.
- (b) Bundles. The bundles must consist of twelve (12) poles laid base to top to form an approximately rectangular cylinder. Materials such as lumber (2" x 4" min.), non-marring banding, and other appropriate bundling materials must be used to make a rigid, long lasting, bundle capable of being handled, shipped and stored without shifting of contents or breaking, subject to approval. Any bundles, in which either poles or packaging is received broken, damaged or with contents shifted, will not be accepted and it will be the responsibility of the supplier to return the bundle to its original destination at no cost to the City of Chicago. The bundles should be capable of being stacked two (2) high without breaking, or shifting of the contents. Each bundle must be capable of being lifted by a fork lift truck or crane and the bundles must be shipped on a flat bed truck to facilitate unloading. Each pole wrapping must be clearly labeled indicating the pole size, i.e. 34'6", 7 GAUGE, STEEL POLE, 15" B.C.
- (c) Hardware. The bolt covers and their attachment devices must be shipped with each bundle and packaged in twelve (12) sets of four (4) each. The package must be labeled and placed in a prominent position to facilitate accessibility, and must be attached to, or within, the bundle in such a manner as to assure safe delivery. Payment will be withheld for any bundle delivered without the accompanying hardware. Pole caps must be attached at the manufacturer's facilities, or be

packed separately in a manner similar to the bolt covers, and the same payment conditions will prevail. Cracked, broken or chipped parts will be considered as an incomplete delivery as regards payment.

- (d) Delivery. All poles will be delivered to the Bureau of Electricity storage yard at 4101 South Cicero Avenue in Chicago, or to another location within the City as indicated on the order. Light pole information must include any recommendations of the manufacturer for storage.

INSPECTION

11. An inspector representing the City must have free entry at all times, while the work on the contract is being performed, to all parts of the manufacturer's works which concern the manufacture of poles. The manufacturer must afford the inspector, without charge, all reasonable facilities to satisfy him that the poles are being furnished in accord with these specifications. The final inspection must be made at point of delivery. Any poles rejected as defective must be removed and disposed of by the contractor at his sole cost.

TABLE A

POLE	GAUGE	BOLT CIRCLE	ANCHOR ROD	BASE 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

POLE	GAUGE	BOLT CIRCLE	ANCHOR ROD	BASE PLATE	TEST LOAD	MAX. DEF	MAX. SET	DRAWING
4.15"x8.0"x 27'6"	3	10.0"	1.0"	1.5"	1500 #	23"	1.0 "	65 5
4.15"x8.0"x 27'6"	7	10.0"	1.0"	1.25	1200 #	23"	1.0 "	65 4
4.20"x7.0"x 20'0"	3	10.0"	1.0"	1.0"	1500 #	13"	1.0 "	65 3
3.70"x6.5"x 20'0"	11	10.0"	1.0"	1.0"	800#	14"	1.0 "	65 2

MAST ARM: TRAFFIC SIGNAL MONO-TUBE

SUBJECT

1. This specification states the requirements for 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 must conform in detail to the requirements herein stated, and to the Specifications and Methods of Test of the American Society for Testing and Materials cited by ASTM Designation Number of which the most recently published revisions will govern.
- (b) Acceptance. 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 must also be submitted in electronic format, preferably Microstation 95, if so requested by the City.
- (d) Drawings. The drawings mentioned herein are drawings of the Department of Streets and Sanitation being an integral part of this specification cooperating to state necessary requirements.
- (e) Sample. If requested by the Chief Procurement Officer, one 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 must warrant the performance and construction of the mast arms to meet the requirements of this Specification and must warrant all parts, components, and appurtenances against defects due to design, workmanship, or material developing within a period of 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 must 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 must 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 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 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 must 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 must be designed appropriately for traffic signal applications within the City of Chicago.

CAP

5. (a) Design. The arm cap must be essentially conical with a globe-shaped upper-end and having a minimum wall thickness throughout of not less than 5/32 inches. The cone portion must meet the skirted portion of the arm in a smooth filet, the skirt must enclose the top 7/8" inches of the arm. Three stainless steel, or other similar approved material, set screws not less than 3/4 inches long must be equally spaced in tapped holes around the skirt and must hold the cap securely in place on the arm.
- (b) Material. The cap must be of aluminum alloy 356-F per ASTM B108. It must have smooth surfaces, neat edges and corners and be free from fins, holes or other casting flaws.
- (c) Finish. Tops must be painted as herein specified.

HARDWARE

6. All the hardware necessary to complete the assembly of the arm must be furnished. All hardware must be stainless steel, or equal corrosion-resistant non-seizing metal, subject to approval.

WELDING

7. (a) General. Every welded joint must be made in conformity with the proper interpretation of the standard welding symbols of the American Welding Society as indicated on the drawings; however, each bidder must submit with his proposal a drawing showing the sizes and types of welds, must state the type of electrode, and must describe the welding methods, he proposes to use in fabricating the 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 be used, the dry method with the direct current must be employed. All transverse welds must be magnetized by the "prod" (Circular magnetization) method. Longitudinal welds may be magnetized by either circular or longitudinal magnetization.

PAINTING

8. (a) Oil and Grease Removal. All metal surfaces must be washed with an alkaline detergent to remove any oils or grease.
- (b) Metal Cleaning. All exterior metal surfaces must be cleaned by blasting with a combination of shot and grit to remove all dirt, mill scale, rust, corrosion, oxides

and foreign matter and provide a "near white" surface in accordance with SSPCS-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 must 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. An engineer from the Bureau of Electricity must be present to witness and certify the tests. If an engineer from the Bureau is unavailable, an independent consultant, approved by the Bureau, must witness and certify the tests. There will be no cost to the City for this. 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.
- (d) The contractor must include in his bid, the cost of travel, food and lodging for one (1) engineer. Travel for 150 miles or greater must utilize a major airline. Lodging accommodations must be equal to those provided at a Holiday Inn. The engineer must be given ten (10) working days notice of travel arrangements.

PACKAGING

- 10. (a) General. The arms must 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 must consist of twelve (12) arms laid base to top to form an approximately rectangular cylinder. Materials such as lumber (2" x 4" min.), non-marring banding, and other appropriate bundling materials must be used to make a rigid, long lasting, bundle capable of being handled, shipped and stored without shifting of contents or breaking, subject to approval. Any bundles, in which either arms or packaging is received broken, damaged or with contents shifted, will not be accepted and it will be the responsibility of the supplier to return the bundle to its original destination at no cost to the City of Chicago. The bundles should be capable of being stacked two (2) high without breaking, or shifting of the contents. Each bundle must be capable of being lifted by a fork lift truck or crane and the bundles must be shipped on a flat bed truck to facilitate unloading. Each arm wrapping must be clearly labeled indicating the mast size, i.e. 30' SIGNAL MAST ARM.
- (c) Hardware. The hardware must be shipped with each bundle and packaged in twelve (12) sets of four (4) each. The package must 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 Bureau of Electricity storage yard at 4101 South Cicero Avenue in Chicago, or to another location within the City as indicated on the order.

INSPECTION

11. An inspector representing the City must have free entry at all times, while the work on the contract is being performed, to all parts of the manufacturer's works which concern the manufacture of arms. The manufacturer must afford the inspector, without charge, all reasonable facilities to satisfy him that the arms are being furnished in accord with these specifications. The final inspection must be made at point of delivery. Any arms rejected as defective must be removed and disposed of by the contractor at his sole cost.

RIGID STEEL CONDUIT (HOT DIPPED GALVANIZED)

SCOPE

1. This specification describes rigid steel conduit, zinc coated. This specification also describes rigid steel conduit that is both zinc and PVC coated. The conduit will be used underground or on structure as a raceway for electrical cables.

GENERAL REQUIREMENTS

2. (a) Rigid steel conduit must be zinc coated by the hot-dip process. Conduit must be furnished in 10 foot lengths, threaded on each end and with one coupling attached to one end and a protective cap at the other end.
- (b) The conduit must be manufactured according to Underwriters Laboratories Standard U.L. - 6 and must meet ANSI Standard C 80.1 and the requirements of NEC Article 344. In addition, conduit must be recognized as an equipment grounding conductor as per NEC Article 250.118(2). There will be no exceptions to meeting these standards.
- (c) Acceptance. Conduit not conforming to this specification will be rejected. The Commissioner will be the final judge in determining if the conduit meets the specification.
- (d) Sample. If requested by the Chief Procurement Officer, a sample of conduit must be submitted to the Engineer of Electricity within fifteen (15) business days of receipt of such a request.
- (e) Warranty. The manufacturer must warrant the construction and performance of the conduit to meet the requirements of this specification and must warrant all parts and components against defects due to design, workmanship, or material developing within a period of one (1) year after the conduit has been put in service.

STEEL

3. Conduit must be formed from steel suitable for use as an electrical raceway. It must be structurally sound so that it will hang straight and true when supported by

hangers in accordance with Chicago electrical code requirements and must be capable of being field bent without deformation of the walls.

Conduit must have a circular cross section sufficiently accurate to permit the cutting of threads in accordance with Table 2 and must provide a uniform wall thickness throughout. All surfaces must be smooth and free of injurious defects. The dimensions and weights of rigid steel conduit must be in accordance with Table 1.

THREADING AND CHAMFERING

4. Each length of conduit, and each nipple, elbow and bend must be threaded on both ends, and each end must be chamfered to remove burrs and sharp edges.

The number of threads per inch, and the length of the threaded portion at each end of each length of conduit, nipple and elbow must be as indicated in Table 2. The perfect thread must be tapered for its entire length, and the taper must be 3/4 inch per foot.

ZINC COATING

5. After all cutting threading and chamfering all conduit surfaces must be thoroughly cleaned before application of zinc. The cleaning process must leave the interior and exterior surfaces of the conduit in such a condition that the zinc will be firmly adherent and smooth.

The conduit must be hot dipped galvanized both inside and out to provide approximately two (2) ounces of zinc per square foot. This is equivalent to 3.4 mils of zinc coating. An additional interior coating to aid in the installation of wires is required.

COUPLINGS

6. (a) The outside surface of couplings must be protected by means of a zinc coating. The zinc content of the coating on the outside surface must be equivalent to a minimum thickness of 3.4 mils.
- (b) Couplings must be so made that all threads will be covered when the coupling is pulled tight on standard conduit threads.
- (c) Both ends of the coupling must be chamfered to prevent damage to the starting threads.
- (d) The outside diameter, length and weight of coupling must be as indicated in Table 3.
- (e) Couplings must be straight tapped, except that the 2 1/2 inch and larger sizes may be taper-tapped.

PVC COATED (WHEN SPECIFIED)

7. (a) Only hot dipped galvanized conduit, couplings, and fittings may be polyvinylchloride (PVC) coated.
- (b) All conduit, couplings, and fittings must be cleaned before being coated.
- (c) All conduit, couplings, and fittings must have a PVC coating applied to the exterior by dipping in liquid plastisol. The coating thickness must be a nominal 40 mils.
- (d) All coated conduit, couplings, and fittings must conform to the requirements of NEMA Standard RN1- Section 3 , "External Coatings". The latest revision will apply.

PACKING AND IDENTIFICATION

8. The pipe must be delivered in bundles. Each length of conduit must be marked with the manufacturer's name or trademark. Securely attached to each bundle at two (2) locations on the bundle must be a weather resistant tag containing the following information:
 - a. conduit size
 - b. footage of bundle
 - c. gross weight of bundle

Precaution will be taken by the contractor in handling during shipment or delivery of conduit, and any conduit found to be damaged will not be accepted.

TEST AND INSPECTION

9. Galvanized rigid conduit must be capable of being bent cold into a quarter of a circle around a mandrel, the radius of which is four times the nominal size of the conduit, without developing cracks at any portion and without opening the weld.

The protective coatings used on the outside and inside surfaces of rigid steel conduit must be sufficiently elastic to prevent their cracking or flaking off when a finished sample of 2 inch conduit is tested within one year after the time of manufacture, by bending it into a half of a circle around a mandrel, the radius of which is 3 1/2 inches.

Tests on sizes other than 1/2 inch may be conducted within one year after the time of manufacture. If such tests are conducted, the conduit must be bent into a quarter of a circle around a mandrel, the radius of which is six times the nominal size of the conduit.

One of the following three test methods must be employed for measuring the thickness or extent of the external zinc coating on conduit:

- (a) Magnetic test.
- (b) Dropping test.
- (c) Preece test (Material which will withstand four 1-minute immersions will be considered as meeting requirements as follows; the zinc content of the coating on the outside surface must be equivalent to a minimum thickness of 3.4 mils).

All tests and inspections must be made at the place of manufacture prior to shipment unless otherwise specified, and must be so conducted as not to interfere with normal manufacturing processes.

Each length of conduit must be examined visually both on the outside and inside to determine if the product is free from slivers, burrs, scale or other similar injurious defects (or a combination thereof), and if coverage of the coating is complete.

If any samples of rigid steel conduit tested as prescribed in this specification should fail, two additional samples must be tested, both of which must comply with the requirements of the specification.

All pipe which may develop any defect under tests, or which may before testing or on delivery be found defective, or not in accordance with these specifications, must be removed by the Contractor at his own expense; and such pipe so removed by the Contractor must be replaced by him within ten (10) days of such rejection with other pipe which will conform to these specifications.

TABLE 1

Design Dimension and Weights of Rigid Steel Conduit

Nominal or Size of Conduit	Inside Diameter	Outside Diameter	Wall Thickness	Length Without Coupling	Minimum Weight Trade of Ten Unit Length w/couplings
(Inches)	(Inches)	(Inches)	(Inches)	(Feet/Inches)	(Pounds)
1/2	0.622	0.840	0.109	9-11 1/4	79.00
3/4	0.824	1.050	0.113	9-11 1/4	105.0
1	1.049	1.315	0.133	9-11	153.0
1 1/4	1.380	1.660	0.140	9-11	201.0
1 1/2	1.610	1.900	0.145	9-11	249.0
2	2.067	2.375	0.154	9-11	334.0
2 1/2	2.469	2.875	0.203	9-10 1/2	527.0
3	3.068	3.500	0.216	9-10 1/2	690.0
3 1/2	3.548	4.000	0.226	9-10 1/4	831.0
4	4.026	4.500	0.237	9-10 1/4	982.0

NOTE: The applicable tolerances are:

Length: + 1/4 inch (without coupling)

Outside diameter: + 1/64 inch or -1/32 inch for the 1 1/2 inch and smaller sizes,
± 1 % for the 2 inch and larger sizes.

Wall thickness: - 12 1/2 %

TABLE 2

Dimensions of Threads

Nominal or Trade Size of Conduit (Inches)	Threads per Inch	Pitch Diameter at end of Thread (Inches) Tapered 3/4 Inch per foot	Length of Thread (Inches)	
			Effective L2	Overall L4
1/2	14	0.7584	0.53	0.78
3/4	14	0.9677	0.55	0.79
1	11 1/2	1.2136	0.68	0.98
1 1/4	11 1/2	1.5571	0.71	1.01
1 1/2	11 1/2	1.7961	0.72	1.03
2	11 1/2	2.2690	0.76	1.06
2 1/2	8	2.7195	1.14	1.57
3	8	3.3406	1.20	1.63
3 1/2	8	3.8375	1.25	1.68
4	8	4.3344	1.30	1.73

NOTE: The applicable tolerances are:

Threaded Length (L4 Col 5): Plus or minus one thread

Pitch Diameter (Col 3): Plus or minus one turn is the maximum variation permitted from the gaging face of the working thread gages. This is equivalent to plus or minus one and one half turns from basic dimensions, since a variation of plus or minus one half turn from basic dimensions is permitted in working gages.

TABLE 3

Designed Dimensions and Weights of Couplings

Nominal or Trade Size of Conduit <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

TRAFFIC SIGNAL MOUNTING BRACKETS FOR MONOTUBE ARMS

SUBJECT

1. This specification states the requirements for mounting brackets which will be used to secure traffic signals and illuminated signs to steel monotube mast arms.

GENERAL

2. (a) Specifications. The mounting brackets 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. Mounting brackets not conforming to these specifications will not be accepted.
- (c) Sample. If requested by the Chief Procurement Officer, one complete mounting bracket must be submitted within fifteen (15) business days upon receipt of such a request. It must be delivered to the Engineer of Electricity, 2451 South Ashland Avenue, Chicago, Illinois 60608.
- (d) Experience. The manufacturer must 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 must 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 bracket will be equivalent to an Olson Sky Bracket in design and function. 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 must allow for mounting and adjustment of signal faces in any direction desired on a fixed mast arm. Adjustments must 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 must 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 must 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 must be smooth and free of defects.

TESTING

- 4. (a) General. One Percent (1%) of the traffic signal mounting brackets in each order must 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) Witness Tests. If so requested by the City, tests will be witnessed by a representative of the Bureau of Electricity. The contractor must include in his bid, the cost of travel, food and lodging for one (1) representative. Travel for 150 miles or greater must utilize a major airline. Lodging accommodations must be equal to those provided at a Holiday Inn. The representative must be given ten (10) working days notice of all travel arrangements.
- (d) Tests.
 - 1. With five (5), twelve inch (12") signal head sections attached to the bracket, the assembly must 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.

INSPECTION

5. An inspector representing the City must have free entry at all times while the work on the contract is being performed, to all parts of the manufacturer's works which concern the manufacture of these mounting brackets. The manufacturer must afford the inspector, without charge, all reasonable facilities to satisfy him that the mounting brackets are being furnished in accord with this specification. The final inspection must be made at point of delivery. Any mounting brackets rejected as defective must be removed and disposed of by the contractor at his sole cost.

GROUND RODS

SUBJECT

1. This specification states requirements for ground rods and clamps to be used for ground electrodes in street lighting, traffic signal, and miscellaneous electrical circuits.

GENERAL

2. (a) Ground rods must be copper clad, steel rods suitable for driving into the ground without deformation of the rod or scoring, separation or other deterioration of the copper cladding.
- (b) Sample. If requested by the Chief Procurement Officer, the contractor must furnish one sample of the ground rod proposed to be furnished within fifteen (15) business days from receipt of such request. The sample ground rod must be delivered to the Engineer of Electricity, 2451 S. Ashland Avenue, Chicago, Illinois 60608.
- (c) Warranty. The manufacturer must warrant every ground rod against defects due to design, workmanship, or material developing within a period of one (1) year after the ground rod has been accepted. Any ground rod which fails during this period must be replaced by the contractor without expense to the City. The Commissioner of Streets and Sanitation will be the sole judge in determining which replacements are to be made.
- (d) The Commissioner of Streets and Sanitation will be the sole judge in determining whether the submitted ground rods meet the requirements of this specification. Ground rods not accepted must be removed at the sole expense of the contractor.

DESIGN

3. (a) The ground rods and couplings must meet the latest requirements of (National

Electrical Manufacturer's Association) NEMA Standard GR-1, for copper bonded ground rod electrodes and couplings. The ground rods must also meet the requirements of (Underwriter's Laboratories) UL 467.

- (b) Ground rods must be made of steel core suitable for driving into the earth without deformation.
- (c) A uniform covering of electrolytic copper, 10 mils in thickness, must be metallicly bonded to the steel core to provide a corrosion resistant, inseparable bond between the steel core and the copper overlay.
- (d) The finished rod must be of uniform cross-section; straight, and free of nicks, cuts or protuberances.
- (e) The rod must be pointed at one end and chamfered at the other.
- (f) All ground rods must be three-quarter inches (3/4") in diameter. The length must be as specified in the order or in the plans. The length and diameter of the rod and the manufacturer must be clearly and permanently marked near the top of the rod (chamfered end).
- (g) All ground rods must have a ground clamp capable of accommodating a No. 6AWG 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.

CORD: TRAFFIC SIGNAL, EIGHT CONDUCTOR NO. 16 AWG, 600 VOLT

SUBJECT

- 1. This specification states the requirements for an eight (8) conductor number 16 AWG, electrical cable, to be installed in poles and conduit and used to electrically energize traffic signal faces at street intersections within the City of Chicago. The cable must be flame retardant, have low acid gas content, good resistance to oil, moisture and mechanical abuse, and exhibit excellent heat aging and electrical characteristics.

GENERAL

- 2. (a) Specifications. The cable must conform in detail to the requirements herein stated, and to the Specifications and Methods of Test of the American Society for Testing and Materials cited by ASTM Designation Number, the Underwriters Laboratories, Inc. Standard or Style number and any other recognized Standardization groups

specifications referred to by the appropriate designation, of which the most recently published revision will govern.

- (b) Acceptance. Cable not conforming to this specification will not be accepted.
- (c) Warranty. The manufacturer must warrant the cable to be first class material throughout. In addition to any other claims against them, if the cable is installed within six months of date of shipment, the manufacturer must replace any cable failing during normal and proper use within two years of date of installation. All replacements under this warranty must be made free of charge F.O.B. delivery point of the original contract.
- (e) Sample. If requested by the Chief Procurement Officer, a three (3) foot sample of the cable intended to be provided under this specification must be submitted to the attention of the Engineer of Electricity within fifteen (15) business days after receipt of such request.

CABLE

- 3. (a) Construction. This cable must consist of stranded, coated, conductors each concentrically encased with a "free stripping," ethylene propylene rubber insulation. Suitable fillers must be used to produce an essentially round cross-section. The insulated conductors and the fillers must be cabled with a suitable left-hand lay as close together as is consistent with forming a core of minimum diameter. A Mylar tape must be wrapped over the conductor assembly, and a jacket applied overall.
- (b) Outer Diameter. The maximum allowable outer diameter must be one-half (0.50) inch.
- (c) Sealing. Both ends of each length of cable must be thoroughly sealed to prevent the entrance of moisture or other foreign matter.

MARKING

- 4. (a) Conductors. Identification must be provided by colors in accordance with I.M.S.A. Standards.
- (b) Jacket. The outer jacket must be marked as follows: "8/C 16 AWG 600V 90°C LSZH, name of manufacturer and date of manufacture. The height of letters must not be less than 1/8 inch in height and the message must repeat at approximately two (2) foot intervals. A sequential footage marking must be located on the opposite side of the jacket. All marking must be perfectly legible with permanent white ink.

CONDUCTOR

- 5. (a) Material. Round, Soft or annealed, stranded copper wire in accordance with ASTM B-3 and B-8, and coated in accordance with ASTM B33 (tin coated) , must be furnished.
- (b) Size. The stranded conductor must consist of stranded wires twisted with an appropriate lay to form a No. 16 AWG conductor with an approximate diameter of

0.048 inches.

INSULATION

6. (a) Type. The insulation must be an easily strippable low smoke zero halogen (LSZH) thermosetting polyolefin compound or ethylene propylene rubber (EPR), or equal meeting or exceeding the requirements of ICEA S-95-658 and the additional requirements of this specification.
- (b) Rating. The insulation must be rated for continuous duty at 90°C in accordance with U.L. AWM Style 3400.
- (c) Thickness. The insulated conductor must be circular in cross-section, concentric to the conductor, with a nominal insulation thickness of 0.031 inches (2/64") and a minimum spot thickness of 90% of the nominal thickness.
- (d) Initial Physical Requirements:
- | | |
|----------------------------------|-------|
| 1. Tensile strength, min., PSI | 1,600 |
| 2. Elongation at rupture, min. % | 250 |
- (e) Air Oven Exposure Test. After conditioning in an air oven at $158 \pm 1^\circ\text{C}$ for 168 hours using methods of test described in ASTM-D 573:
- | | |
|--|-----|
| Tensile strength, minimum percent of unaged value | .85 |
| Elongation at rupture, minimum percent of unaged value | .65 |
- (f) Mechanical Water Absorption:
1. Gravimetric Method. After 168 hours in water at $70 \pm 1^\circ\text{C}$:
- | | |
|---|------|
| Water absorption, maximum, milligrams per square inch . . . | .5.0 |
|---|------|
- (g) Cold Bend Test Requirements. The completed cable must pass the "Cold-Bend," Long-Time Voltage Test on Short Specimens of ASTM D-470 except that the test temperature must be minus (-) 25°C.
- (h) Electrical Requirements:
1. Voltage Test. The completed cable must meet an A.C. and D.C. voltage test in accordance with ASTM D-470 and D-2655.
2. Insulation Resistance. The completed cable must have an insulation resistance constant of not less than 20,000 when tested in accordance with methods shown in ASTM D-470.
- (i) Flexibility Tests. A sample length of insulated conductor must be formed in a loose coil, placed in a circulating air oven, and aged for 168 hours at $158^\circ\text{C} \pm 1^\circ\text{C}$. The sample must then be allowed to cool to room temperature for one (1) hour and tightly wrapped around a 3X metal mandrel. The sample must show no cracks and

must pass the same voltage test specified for the "Cold-Bend Test."

JACKET

7. (a) Type. The jacket must be a thermosetting low smoke zero halogen (LSZH) polyolefin compound or chlorinated polyethylene (CPE), or equal meeting the physical and electrical requirements specified herein.
- (b) Rating. The jacket must be rated for continuous duty at 90° C.
- (c) Thickness. The jacket must be circular in cross-section, concentric with the insulation, must have an average thickness not less than 45 mils and a spot thickness not less than ninety percent (90%) of the average thickness.
- (d) Initial Physical Requirements:
- | | | |
|----|--|------|
| 1. | Tensile strength minimum PSI | 1800 |
| 2. | Elongation at rupture, minimum percent | 300 |
- (e) Air Oven Exposure Test. After conditioning in an air oven at $121 \pm 1^\circ\text{C}$ for 168 hours for LSZH or $136 \pm 1^\circ\text{C}$ for CPE:
- | | | |
|----|---|----|
| 1. | Tensile strength, minimum percent of unused value | 75 |
| 2. | Elongation at rupture, minimum percent of unaged valued | 55 |
- (f) Mechanical Water Absorption. After 168 hours at $70 \pm 1^\circ\text{C}$:
- | | | |
|----|-------------------------------------|----|
| 1. | Milligrams per square inch, maximum | 20 |
|----|-------------------------------------|----|

TESTING

8. (a) General. Tests must be performed on insulation, jacket and completed cables in accordance with applicable standards as listed in this specification. Where standards are at variance with each other or with other portions of this specification, the most stringent requirements, as determined by an engineer from the Bureau of Electricity will apply.

All tests must be conducted on cable produced for this order. Where cable insulation and/or jacket thickness preclude obtaining samples of sufficient size for testing, special arrangements must be made with the engineer to obtain samples of unprocessed materials directly from the extrusion feed bins which will be separately processed and prepared for tests.

- (b) Number of Tests. Insulation and jacket tests must be conducted on samples taken every 25,000 feet or fraction thereof of each conductor size. In no case must samples be taken closer than 15,000 feet apart.

- (c) Witness Tests. Where the quantity of cable on a single purchase order is 100,000 feet or more, all insulation and jacket tests must be witnessed by an engineer from the Bureau of Electricity, if so requested by the City. Reels to be tested will be selected at random. The contractor must include in his bid, the cost of travel, food and lodging for one (1) engineer. Travel for 150 miles or greater must utilize a major airline. Lodging accommodations must be equal to those provided at a Holiday, Inn. The engineer must be given ten (10) working days notice of all travel arrangements.
- (d) Test Reports. No cable must be shipped until certified copies of all factory tests, including witness tests where applicable, have been reviewed and approved by the engineer.
- (e) Acceptance. Samples must be taken from each reel and must successfully conform to all tests specified herein. Reels from which samples fail to conform, will be rejected.

PACKAGING

- 9. (a) Reels. The completed cord must be delivered on sound, substantial reels. The ends of the cable must be securely fastened so that they will not become loose during shipment and handling.
- (b) Footage. The number of feet per reel must be five hundred (500) feet plus or minus ten percent ($\pm 10\%$).
- (c) Marking. A metal tag, or an approved indelible marking material such as alkyd enamel paint, must be used to mark the reel. The marking information must include, but not be limited to, the following: reel number, contract number, a description of the cord, and the footage of that particular reel.

LUMINAIRE: ALLEY, FOR 250 WATT HIGH PRESSURE SODIUM LAMP WITH I.E.S. TYPE II DISTRIBUTION

SUBJECT

- 1. This specification states the requirements for an alley lighting luminaire, with integral ballast, for use with a horizontal burning 250 watt high pressure sodium lamp. The luminaire is to be mounted 16 to 20 feet above the alley by attachment to a one and one-quarter inch steel pipe. Luminaires furnished under this specification must be completely assembled and ready for installation, and must be similar to General Electric Company, Type M250A2 Except as otherwise indicated herein, and as approved by the Commissioner of Streets and Sanitation or his duly authorized representative.

GENERAL

- 2. (a) Information Required. Each bidder must submit with his proposal the following information pertaining to the luminaire he proposes to furnish:

1. Outline Drawing.
 2. Complete description and weight.
 3. Isocandela diagrams showing complete information necessary to determine available light distribution of the luminaire.
 4. Isofootcandle diagrams.
 5. Coefficient of utilization curves.
 6. Charts showing distribution of light flux from the luminaire.
 7. Projected area in square feet.
 8. Manufacturer's name and catalog description of the luminaire.
 9. Candlepower curves showing vertical distribution in the plane of maximum candlepower and lateral distribution in the cone of maximum candlepower.
 10. IES formatted photometric curves in electronic format.
- (b) Approval. Wherever approval and approved are used in this specification they will mean a written approval by the Commissioner of Streets and Sanitation, or his duly authorized representative, to be secured prior to proceeding with manufacture of these luminaires.
- (c) Sample. One completely assembled luminaire of the manufacture intended to be furnished must be submitted, within fifteen (15) business days upon request of the Chief Procurement Officer. The sample luminaire must be delivered to the attention of the Engineer of Electricity at 2451 S. Ashland Ave., Chicago, Illinois 60608.
- (d) Assembly. Each luminaire must be delivered completely assembled, wired and ready for installation, but will not contain the lamp or fuses. Each luminaire must be complete with all components specified herein including, but not limited to, aluminum housing, refractor, reflector, ballast components, terminal board, lamp socket, photocontrol receptacle, gaskets, slipfitter and all necessary hardware.
- (e) Warranty. The manufacturer must warrant every luminaire against defects due to design, workmanship, or material developing with a period of one (1) year after the luminaire has been placed in service. This will be interpreted particularly to mean failure of any ballast component, loss of reflectivity of reflecting surface, and discolorations or fogging of the refractor impairing the transmission of light. Any luminaire, or part thereof, developing defects within the period specified must be replaced by the manufacturer without expense to the City. The Commissioner of Streets and Sanitation will be the sole judge in determining which replacements are to be made, and his decision will be final.

CONSTRUCTION

3. (a) Housing. The housing must be a precision die-casting. The wall thickness must be substantial and adequate enough to withstand the strains likely to be imposed on the housing when installed and in service. The housing must enclose the slipfitter, lamp socket, photocontrol receptacle, reflector, terminal board, the ballast components, with provision for proper mounting of these parts. The housing must have provision on its top surface to permit leveling with a spirit level. The housing must have heat sink characteristics, such that all enclosed components will operate within their designed operating temperatures under expected service conditions.(b) Design. The luminaire must have the characteristic Acobra-head

design, subject to approval.

- (c) Projected Area and Weight. The effective projected area of the luminaire must not exceed 0.7 square feet and its weight must not exceed 30 pounds with a 250-watt, high power factor, reactor ballast.
- (d) Slipfitter. The slipfitter must be suitable for attachment over the end of either a one and a quarter inch (1-1/4") through two inch (2") pipe bracket 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, wind and ice loads. The slipfitter 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.
- (e) Lamp Socket. The mogul, multiple, porcelain enclosed lamp socket must be a high quality commercial product. The product must have integral lamp grips and spring loaded center contact. To assure good mechanical and electrical connections, the lamp leads must be directly connected to the socket contacts by welded or indented-compression connections. The socket position must be set to provide the medium-non-cutoff, Type II distribution.
- (f) Reflector. The reflector must be separate from the housing and must be fabricated of a high purity, clad-aluminum surface, polished to an approved highly specular finish, with a minimum reflectivity of 82% and a minimum protective oxide coating of 7.5 milligrams per square inch. The reflectivity must be determined with a Taylor-Baumgardner Reflectometer, and the weight of the oxide coating by the method of test detailed in ASTM B137. It must be held securely in the housing but be easily removed and replaced. It must be mounted in such a manner as to provide a proper mating with the refractor creating a totally enclosed and completely dustproof optical assembly. A silicone rubber or EDPM (ethylene propylene diene monomer) molded, cavity type, gasket must be fitted on the reflector flange to seal between reflector and refractor. A breathing filter of activated charcoal must be incorporated in the reflector to effectively filter out dirt and particulate contaminants.
- (g) Refractor. The refractor must be molded, UV stabilized, polycarbonate having a minimum cross section of 3/32" thickness. It must contain prisms pressed on the inner and outer surfaces, as necessary. It must be made of GE Lexan SLX, or an approved equal.
- (h) Refractor Ballast-Holder Door. The refractor ballast-holder door must be a precision, aluminum die casting hinged to the luminaire housing and opening downward toward the rear of the luminaire approximately 90 degrees to allow access to the optical and ballasting systems. The hinging arrangement must be of an approved construction with corrosion resistant hinge fittings. The door must be removable without the use of tools and have a safety feature to prevent accidental unhinging, subject to approval. The refractor must be securely held in the holder door, and be easily removed, by means of single action, quick release, corrosion resistant latches. The closed door must position the refractor in precise optical

alignment with the lamp and exert positive pressure against the sealing gasket. A sturdy spring bail latch must permit single glove-handed release of the door. A large letter "A" must be cast onto the rear bottom of the door and be visible and identifiable from the ground with the luminaire mounted at a height of 20 feet above grade.

All ballast components must be mounted on the door and connected to the luminaire electrically with a quick-disconnect plug. The disconnect must be sturdy enough to withstand normal handling shock, and pole and wind vibration, without loosening of the connection and ultimate deterioration due to current arcing.

- (i) Ballast Access Door-Panel. A separate door must be provided for access to electrical parts enclosed in the housing. It must be a precision aluminum die-casting of rugged construction. The door must be removable and must have a safety feature to prevent accidental unhinging. The hinge and fastening devices must be captive parts which will not become disengaged from the door panel. An adhesive backed vinyl-impregnated cloth marker with the designation "25" in 2" high black numbers on a yellow background must be attached to the ballast access door. The marker must be identifiable from the ground when the luminaire is mounted at a height of 20 feet.
- (j) Terminal Board-Fuse Block. A terminal board of high grade molded phenolic plastic of the barrier or safety type must be mounted within the housing in a readily accessible location. It must provide all terminals needed to completely prewire all luminaire components. The terminal board must either incorporate a barrier isolated section with fuse clips to take a small dimension (13/31"x 1- 1/2") cartridge fuses or a separate barrier protected fuse block must be provided. The fuse-block must be factory wired to the appropriate terminals. The terminal board -fuse block must have plated copper or plated brass, clamp type pressure terminals which will accommodate wire sizes from #12 AWG to #8 AWG.
- (k) Receptacle for Photocontrol. A three (3) pole twist lock receptacle conforming to EEL-NEMA standards must be mounted in the top of the housing for an external, plug-in, photo-control. The beryllium copper or phosphor bronze contacts must be enclosed in an approved, insulated body, and the three #16 gauge (minimum) coded lead wires must be directly connected to the socket contacts by welded or indented compression connections. A rigid support flange must provide a tight surface contact with the mounting hub of the housing, and provide for proper seating of the photo-control gasket. The receptacle must be rotatable through 360 degrees with provisions for secure fastening in any position. The lead wires must be stranded, flexible conductors with indented compression terminals to allow rapid connection to the terminal board. The photocontrol unit will be supplied by others.
- (l) Socket Gasket. The socket opening in the reflector must be sealed by either a flat-reinforced, or molded gasket of Dacron felt or rubber like material.
- (m) Back Closure. A rigid wall of neoprene or other material with a tight fitting opening for a 1-1/4" diameter pipe must be firmly fitted at the attachment end of the luminaire to provide an effective barrier against bugs, wasps and birds.
- (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 must be of stainless steel, copper silicone alloy or other approved non-corrosive or suitably protected metal and where necessary must be plated to prevent electrolytic action by contact within aluminum.

- (o) Finish. The luminaire must have a light gray enamel finish baked on. Surface texture and paint quality will be subject to approval. Color must be Munsell No. 5BG 7.0/0.4 (designated ASA No. 70).

BALLAST REQUIREMENTS

- 4. (a) General. The integral ballast must be a high power factor, linear type, low loss reactor. It must be designed to furnish proper electrical characteristics for starting and operating a 250 watt high pressure sodium vapor lamp at temperatures as low as minus (-) 20° Fahrenheit. The ballast winding must be adequately impregnated and treated for protection against the entrance of moisture and dirt, insulated with Class H insulation, and be able to withstand the ANSI standard dielectric test. The ballast must include an electronic lamp starting component.
- (b) Lamp Operation. The ballast must provide positive lamp ignition at an input voltage of 95 volts. It must operate the lamp over a range of input voltage from 95 to 125 volts without damage to the ballast. It must provide lamp operation within lamp specifications for rated lamp life at input voltages between 106 and 125 volts.
- (c) Rating. The ballast must have properly coded wire leads for rated input voltage of 115 volts at 60 Hertz, which must drive a nominal 100 volt lamp at 250 watts. The design range of the input voltage for this ballast must be from +6% to -8% of the nominal voltage (115 volts).
- (d) Lamp Current. The ballast must supply approximately 2.2 amperes to a 250 watt, 100 volt high pressure sodium lamp during operation, and nor more than 3.0 amperes at starting.
- (e) Power Factor. The power factor of the ballast over the design range of input voltage specified above (+6% to -8%) must not be less than 90%.
- (f) Line Current. With nominal input voltage applied, the input current under starting, short circuit, or open circuit conditions must not exceed 4.7 amperes.
- (g) Lamp Wattage. The ballast must deliver 250 watts to a 100 volt lamp when operating at the nominal (115 volt) input voltage. Wattage input to the 100 volt lamp must not vary more than a total of 30% over the input voltage design range of 106 volts to 122 volts.
- (h) Ballast Losses. Wattage loss of the ballast must not exceed 45 watts when delivering 250 watts to a 100 volt lamp at the nominal input voltage of 115 volts.
- (i) 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.

- (j) Electronic Starter. The lamp starter component must be a solid state device capable of withstanding ambient temperatures of 100° Centigrade. The starter must provide timed high voltage pulsing with sufficient follow through current (0.2 amp.) To positively start the lamp. Minimum amplitude of the pulses must be 2500 volts with a minimum width of one microsecond at 2250 volts and must be applied within 20 electrical degrees of the peak of the open circuit voltage wave with a repetition rate of one each half cycle of the 60 Hertz waveform. Positive lamp starting must be provided over a range of input voltage from 95 volts to 125 volts. The starter device must be adequately coated to provide protection against entrance of dirt and moisture.
- (k) Reliability. Under normal use in a normal electrical environment, the failure rate of the Electronic Starter must not exceed one-half percent per thousand hours of operation.
- (l) Crest Factor. The lamp current crest factor (peak to rms) must not be greater than 1.6 when operated at nominal conditions and must not exceed 1.8 when operated over a +6% to -8% voltage range.
- (m) Mounting. The ballast component must be mounted and fastened within the luminaire housing in a manner such that the components will remain secure and capable of withstanding the shock and vibration which occur during installation and service. The ballast components must be readily removable for service and replacement.
- (n) Wiring. The lamp socket and ballast components must be completely wired, with connections made through a photoelectric control twist lock receptacle, to an approved terminal board which accommodates No. 14 through No. 6 AWG wire sizes. The reactor and capacitor leads must be No. 16 AWG, or larger, conductors with push-on terminals for simple wiring or component replacement. These leads must be insulated with an approved 125° Centigrade, 600 volt AC, class of insulation, and must be color coded for identification. A complete wiring diagram, must be displayed at a prominently visible location on the interior of the ballast section.
- (o) Capacitor. The capacitor must be an A.C., low-loss, non-PCB type. The capacitor electrical losses must not exceed 2 watts during normal luminaire operation. The capacitor must be coated painted or fabricated of non-corrosive material to inhibit corrosion and rust formation.
- (p) Core and Coil. The core and coil structure must be of the bobbin type having high dielectric integrity and stability and must withstand the ANSI C82.4-1978 impulse and hipot voltage requirements. All magnetic wire terminations must be mechanically secured with bobbin-held connectors to provide mechanical integrity and quick electrical disconnect capability.
- (q) Measurements and Tests. Measurements and tests, when required, must be made with a nominal lamp at nominal ballast line voltage, the lamp burning in a closed luminaire and the ballast operating at a thermally stabilized temperature in a 25° Centigrade ambient luminaire environment.

LIGHT DISTRIBUTION

5. (a) Light Distribution. The socket position upon delivery of the luminaire must be set to provide an I.E.S. "Medium, Not-Cutoff, Type II" distribution.
- (b) Average Illumination. The average, initial, horizontal illumination must be 0.89 footcandles, when lighting a 16 foot wide by 180 foot long alley section, with one luminaire mounted at each end of the 180 feet on the same side of the alley.
- (c) Uniformity. The uniformity ratio of illumination, average to minimum footcandles (avg/min.), within the alley section specified must not exceed 9:1 for the M-N-II distribution.
- (d) Stray Light. The average initial horizontal footcandles along a line twelve feet (12') beyond the far alley property line, and parallel to the property line, must not exceed 20% of the average initial horizontal footcandles of the alley section.
- (e) Maximum Requirements. The maximum cone must be 75 degrees, and the maximum vertical plane must be 82.5 degrees, for the M-N-II distribution.

PACKAGING

6. (a) Packing. Each luminaire assembly must be packed in a suitable carton so secure that it will not be damaged in shipment and handling.
- (b) Marking. Each carton containing a luminaire must be clearly marked on the outside in letters not less than three-eighths (3/8) inches tall with the legend **A LUMINAIRE FOR 250 WATT LAMP, ALLEY, HPS, IES TYPE IIe**. Also included in the marking should be appropriate City Commodity Code, the name of the manufacturer, the date of manufacture, and the contract number under which the luminaire is furnished.

TRAFFIC SIGNAL: VEHICULAR, TWELVE-INCH SINGLE FACE, SINGLE OR MULTIPLE-SECTION, POLYCARBONATE, LED OR INCANDESCENT

1.0 GENERAL REQUIREMENTS

- 1.1 This specification states the requirements for twelve-inch, single face, single and multiple-section, traffic signals with polycarbonate housings, using LED or incandescent light source, for use in the traffic control system of the City of Chicago. Units include red ball, yellow ball, green ball, red arrow, yellow arrow, and green arrow.
- 1.2 Sample and Certified Test Reports. One complete signal, fully assembled and wired, of the manufacture proposed to be furnished, must be submitted along with the required certified test reports, within fifteen (15) business days upon request of the Chief Procurement Officer. The sample must be delivered to the Engineer of Electricity, Bureau of Electricity, 2451 South Ashland Avenue, Chicago, Illinois 60608.
- 1.3 Standards. Equipment furnished under this specification must meet the appropriate requirements of the following standards, as required within the body of this specification:

American Association of State Highway and Transportation Officials (AASHTO)
American Society for Testing and Materials (ASTM)
Institute of Transportation Engineers (ITE)
National Electrical Manufacturers Association (NEMA)
Underwriters Laboratories (UL)

- 1.4 Approval. Approval will mean approval in writing by the Commissioner or his/her duly authorized representative.
- 1.5 Warranty. The manufacturer must warrant the signals to meet the requirements of this specification, and must warrant all equipment, components, parts and appurtenances against defective design, material and workmanship for a period of three (3) years from date of acceptance. In addition, LED optical units must carry a seven (7) year warranty against failure or loss of color (chromaticity) and signal brightness (luminance) below minimum acceptable VTCSH standard levels from date of final acceptance for contract construction, or date of delivery on a specific order. In the event defects or failures occur in the LED units during the warranty period, the manufacturer must replace all defective units, at no expense to the City. This warranty must be evidenced by a letter or certificate of warranty submitted to the City at the time delivery is made. The LED warranty must cover all units delivered in an order or installed by contract, and must include unit serial numbers. The warranty must be signed and dated by an official of the manufacturer who is empowered by the manufacturer to enter into such a warranty.

2.0 MATERIALS AND EQUIPMENT REQUIREMENTS

- 2.1 The traffic signal heads must conform to ITE Standard "Vehicle Traffic Control Signal Heads" (VTCSH), in which the most recently published revision will govern.
- 2.2 Housing. The housing of each section must be one piece, ultraviolet stabilized polycarbonate resin of the specified color, injection molded complete with integral top, bottom, and sides, having a minimum thickness of 0.1 inch.

(a) The polycarbonate must meet or exceed the following tests:

TEST	REQUIRED	METHOD
Specific gravity	1.17 minimum	ASTM D 792
Vicat Softening temp	310-320° F	ASTM D 1525
Brittleness temp.	-200° F	ASTM D 746
Flammability	Self-extinguishing	ASTM D 635
Tensile strength, yield	8,500 PSI	ASTM D 638
Elongation at yield	5.5-8.5%	ASTM D 638
Shear strength, yield	5,500 PSI min.	ASTM D 732
Izod impact strength (notched, 1/8" thick)	12-16 ft-lbs/in.	ASTM D 256
Fatigue strength (at 2.5 mm cycles)	950 PSI min.	ASTM D 671

(b) Assembly. A traffic signal section must be comprised of, but not limited to, the housing, hinged door, visor, optical unit and all necessary gaskets and hardware. The multi-section, single face, traffic signal must be comprised of single face single sections assembled together, containing an internally mounted terminal block.

Arrow indications must be shipped as single sections. The traffic signals must be designed and constructed to permit sections to be assembled together, one above the other, forming a weatherproof and dust-tight unit.

- (c) Individual sections must be fastened together with a coupling washer assembly composed of two washers, three zinc plated bolts, nuts, and lock washers which lock the individual sections together. As an alternative, individual sections may be fastened together with four cadmium plated bolts, lock washers, and nuts. The hole in the coupling washer assembly must accommodate three 3/4 inch cables.
- (d) Height. The overall height of an assembled traffic signal must be fourteen (14) inches for a single-section signal, forty-two (42) inches for a three-section signal, and seventy (70) inches for a five-section, plus or minus one (1) inch.
- (e) Mounting. The traffic signal must be designed for mounting with standard traffic signal brackets using 1-1/2 inch pipe size fittings.
- (f) Positioning Device. The top and bottom opening of each housing must have integral serrated bosses that will provide positive positioning of the signal head in five degree increments. A total of 72 teeth must be provided in the serrated bosses to allow the signal face to be rotated 360 degrees about its axis. The teeth must be clean and well defined to provide positive positioning.
- (g) Hinges. The signal housing must be sectional; one section for each optical unit. Each housing must have four integral hinge lugs, with stainless steel hinge pins (AISI 304 or equivalent), located on the left side for mounting the door. The hinge pins must be straight and not protrude past the outside of the housing lugs. The housing must have two integral latching bolt lugs on the right side each with a stainless steel hinge pin to which a latching bolt (AISI 304 or equivalent), washer, and wing nut will be attached. The wing nuts must be captive. Each housing must be equipped with holes to be used for mounting backplates.
- (h) Door. The door must be a one piece ultraviolet stabilized polycarbonate resin of the specified color, injection molded complete with a minimum thickness of 0.1 inch. Two (2) hinge lugs on the left side and two (2) sets of latch screw jaws centered on the right side, as viewed from the front of the signal, must be integrally cast with the housing door. The door must be hinged to the housing with two (2) stainless steel hinge pins, drive fitted. Two (2) stainless steel latch screws and wing nut and washer assemblies on the latch side of the housing body must provide for opening and closing the door without the use of tools. The door must have eight (8) holes with threaded metal inserts for stainless steel machine screws to secure the visor(4 holes) and the lens(4 holes). The inside of the door must be grooved to accommodate a one piece, air-cored EPDM (ethylene propylene diene monomer) gasket to provide a weatherproof and dust proof seal when the door is closed. The inside of the door must have four equally spaced threaded metal inserts for the lens attachment. The outside of the door must have an integral rim completely encircling the lens opening to prevent leakage between the door and the lens. The rim must have four equally spaced tabs around the circumference with threaded metal inserts for the visor.
- (i) Visor Each traffic signal must have a visor for each signal indication (section). The

visor must be the tunnel type, nine and one-quarter inches (9-1/4") long, fabricated of ultraviolet stabilized polycarbonate resin of the specified color, injection molded. The visor must fit tightly against the door and not permit any light leakage between the door and visor. All hardware necessary for, but not limited to, attachment of the visor must be of stainless steel. The visor must have four mounting lugs for attaching the visor to the door. Screws must go through the visor lugs into the metal inserts in the door to secure the visor.

- 2.3 The traffic signal heads must be provided with incandescent or LED optical units as specified in the line item or Contract Plans.

2.3.1 INCANDESCENT OPTICAL UNITS

- (a) Incandescent Optical Unit. The incandescent optical unit consists of the lens, reflector and lamp holder. The optical unit and visor must be designed as a whole so as to eliminate the return of outside rays entering the unit from above the horizontal (known as sun phantom). The optical unit must be designed and assembled so that no light can escape from one indication to another.
- (b) Lenses. The red, yellow and green polycarbonate lenses must be round with a nominal twelve (12) inch diameter and must conform to all requirements set forth under the heading "Traffic Signal Lenses" in the ITE standard. The red, green or yellow arrow lenses must be round with a nominal twelve (12) inch diameter and the outside surface must be covered, except for the arrow, with a dull or dark grey opaque material of a thickness sufficient to totally hide the light from a 2000-lumen lamp placed behind it operating at rated voltage. The opaque material must be hard and durable and must be bonded such that it will not peel or flake when subject to the heat of a signal lamp or when the lens is washed. The shape and size of the arrow must be of an approved design with a minimum stroke of fifteen-sixteenths (15/16) inch. The arrow must appear uniformly illuminated when viewed from angles usually encountered in service, whatever may be the angular position of the lens in the signal section. The lens must be enclosed by an air-cored EPDM (ethylene propylene diene monomer) gasket providing a weather proof and dust proof seal between the lens, door, and reflector assembly. The gasketed lens must be secured to the housing door by four (4) stainless steel screws (AISI 304 or equivalent) and clamps equally spaced around the lens opening. The door must have threaded metal inserts to receive the screws.
- (c) Reflector. The reflector must be fabricated of high-purity, clad-type aluminum sheet formed to a parabolic shape and cut to fit in a circular polycarbonate, hinged frame for rigid mounting within the housing. The circular rim of the reflector must be mounted in such a way as to seal the internal optical system by being compressed against the lens gasket when the signal door is closed. The reflecting surface must be an "ALZAK" class SI specular finish having a minimum reflectivity of eighty-two (82) percent and a protective oxide coating of 7.5 milligrams per square inch, minimum. The reflectivity must be determined with a Taylor-Baugartner Reflectometer, and the weight of the protective oxide coating by the method of test outlined in ASTM B 137. The reflecting surface must be tested for proper sealing by applying one (1) drop of a water solution (1 gram per 50 cc) of Anthraquinone Violet R at a room temperature. After five (5) minutes, the dye must be washed from the surface with running water. No stain must remain after the

surface is lightly rubbed with a soft cloth wet with mild soap and water, and rinsed with water. The reflector must have an opening in the back to accommodate the lamp holder.

- (d) Lamp Holder. The lamp holder must have a heat, moisture and weatherproof molded phenolic housing designed to accommodate a standard 133 watt, 3 inch light center length, incandescent lamp. The lamp holder must be so designed that it can be readily rotated and positively positioned to provide proper lamp filament orientation and focus. The inner brass shell, or ferrule, of the lamp holder must have a grip to prevent the lamp from working loose due to vibration. A gasket must be furnished at the junction of the lamp holder and the reflector.

2.3.2 LIGHT EMITTING DIODE (LED) OPTICAL UNITS

- (a) Light emitting diode (LED) optical units must consist of an integral unit containing the following components: power leads, housing, integral lens, matrix of light emitting diodes (LEDs) emitting monochromatic light of desired signal color, and electronic and electrical components necessary to permit operation at nominal 120 volt, 60 hertz power.
- (b) The LED unit must be of such dimensions as to permit mounting in any standard traffic signal housing, be interchangeable with incandescent optical units, and must include appropriate gasket for this purpose. Gasketing provided must provide a watertight seal meeting existing ITE standard for signal heads, and exclude the infiltration of moisture into either the signal housing or into the LED optical unit case.
- (c) The LED unit must meet the applicable requirements of the ITE standards for Vehicle Traffic Control Signal Heads(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 must meet the green module requirements for brightness.
- (d) Minimum brightness of LED signal units must be in accordance with the luminous requirements in a standard testing procedure as defined by Section 4 of the VTCSH Part 2: LED Vehicle Signal Modules. During the required operating life of LED signal units, the luminance output of the units must not be less than 60 percent (.60) of the values specified in the standard.
- (e) Unit lenses must be twelve inches in diameter and be constructed of ultraviolet (UV) stabilized, impact resistant polycarbonate, acrylic or other approved material. Lenses must be clear or tinted.
- (f) Units must consist of LEDs uniformly distributed to present a homogeneous appearance on the face of the lens from a wide viewing angle.
- (g) LEDs must be wired so that the loss of a single LED or a string of LEDs will not reduce the luminescence below the minimum requirement.
- (h) For purposes of this specification, failure of a single unit is defined as an occurrence where the luminescence of the signal measured in candela in standard

test procedures is less than the required initial luminance or luminance at time points and conditions specified; or where minimum required brightness is achieved, but two or more series strings of LEDs or in excess of twenty percent of 20% of LEDs are not operable.

- (i) Unit power supply must be constant current regulated and filtered to provide instant on indications, and to prevent momentary signal outages or flicker. Units must be fully operable over a range of 90 volts to 130 volts at 60 hertz, plus or minus 3 hertz.
- (j) Surge protection: Each unit must be provided with integral surge protection to withstand transient of 600 volt, 100 microsecond rise and 1 millisecond pulse width. The surge protector must provide full electrical and physical protection to all unit components.
- (k) Maximum permissible power consumption at ambient conditions (nominal 120 volts, 60 hertz, 70 degrees F.) must be 30 watts at a minimum 90 percent power factor. Power consumed must not vary by more than ten (10) percent from nominal power consumption over voltage range of 105 volts to 125 volts, and over permissible environmental ranges.
- (l) Units must be fully operable at temperature ranges of -40 degrees F. (-40 deg C) to +165 degrees F. (+74 deg C) at up to 100 percent relative humidity.
- (m) Units must be clearly marked on the back surface of the unit in a permanent manner showing information required for warranty and long term performance. Information to be shown must include manufacturer name, date of manufacture, electric power requirements, signal model type including color and indication type, and signal serial number.
- (n) The LED unit must be compatible with the traffic signal controller equipment currently in use by the City of Chicago, and meeting the City=s latest specifications for traffic signal control equipment. In particular the LED unit must be compatible with the NEMA TS-1 and later traffic signal load switches and conflict monitors.
- (o) Units must meet applicable sections of Title 47, SubPart B, Section 15 of the Federal Communications Commission (FCC) rules as applies to electronic noise limitation and electromagnetic interference.
- (p) Total harmonic distortion (THD) induced into the voltage and current AC power line sine waves must not exceed 20 percent.
- (q) LED optical units must meet the requirements of VTCSH Part 2: LED Vehicle Signal Modules Section 6.3.1 for signal burn-in.

2.4 Wiring. Each lamp holder must be furnished with two (2) leads color coded as follows:

White	Common
Red	Red Lens Section
Yellow	Yellow Lens Section
Green	Green Lens Section
Green with Black Tracer	Green Arrow Lens Section
Yellow with Black Tracer	Yellow Arrow Lens Section

Red with Black Trace Red Arrow Lens Section

The lead must be type TEW No. 18 AWG stranded copper wire with 2/64 inch thick, 600 volt, 105 degree centigrade rated, thermo-plastic insulation meeting MIL-W-76A specifications. The lead must connect to the terminal strip without being spliced. The ends of the lamp leads must be stripped of one-half inch (2") of insulation and tinned.

- 2.5 Terminal Strip. A dual-point, barrier type terminal strip with a solid base and pressure plate type connectors (Marathon Special Products Corporation Catalog No. TB-305-SP, or equal) must be securely attached at both ends to the housing body inside the "Green" section of the signal head.
- 2.6 Cable. One, eleven foot (11') length of flexible electric cord, medium duty, type SO, No. 16 AWG stranded copper conductor, color coded, rubber insulated, neoprene jacketed, must be furnished with each signal head. The number of conductors must include neutral, ground, and one switch leg for each section. Both ends of each cable length must be carefully stripped of six inches (6") of jacket and one inch (1") of insulation, and each conductor properly tinned.
- 2.7 Gaskets. Wherever necessary to make a completely dustproof, moisture proof and weatherproof assembly of the housing and optical system, approved type gaskets of neoprene or silicone rubber must be provided.
- 3.0 TESTING AND DOCUMENTATION REQUIREMENTS
- 3.1 Documentation. The contractor must provide certified manufacturing and testing documentation to demonstrate that the traffic signals being supplied meet or exceed the specification requirements. The LED Optical Units must be tested by an independent and certified testing laboratory.
- 3.2 Inspection. The signals will be subject to inspection at the discretion of the Commissioner. Final inspection must be made at point of delivery. Any signal rejected must be removed and disposed of by the contractor at his sole cost.
- 4.0 PACKING
- 4.1 Packing. Each traffic signal assembly must be packed in a suitable carton so secured that the signal will not be damaged during shipment, handling or storage.
- 4.2 Marking. Each carton containing a traffic signal must be clearly marked on the outside in letters not less than three-eighths (3/8) inch tall with the legend: "TRAFFIC SIGNAL, TWELVE-INCH, POLYCARBONATE® or ΔTRAFFIC 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.

**PEDESTRIAN TRAFFIC SIGNAL, 16 INCH WITH SYMBOLIC LED WALK/DON'T WALK
LENSES POLYCARBONATE HOUSING**

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 Engineer of Electricity, Bureau of Electricity, 2451 South Ashland Avenue, Chicago, Illinois 60608.
- (b) Standards. Equipment furnished under this specification must meet the appropriate requirements of the following standards, as required within the body of this specification:

American Association of State Highway and Transportation Officials (AASHTO)
American Society for Testing and Materials (ASTM)
Institute of Transportation Engineers (ITE)
National Electrical Manufacturers Association (NEMA)
Underwriters Laboratories (UL)
- (c) Approval. Approval will mean approval in writing by the Commissioner or his/her duly authorized representative.
- (d) Warranty. The manufacturer must warrant the signals to meet the requirements of this specification, and must warrant all equipment, components, parts and appurtenances against defective design, material and workmanship for a period of three (3) years from date of acceptance. In addition, LED optical units must carry an additional warranty against failure or loss of color (chromaticity) and signal brightness (luminance) below minimum acceptable VTCSH 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 must be evidenced by a letter or certificate of warranty submitted to the City at the time final delivery is made. The warranty must cover all units delivered in an order or installed by contract, and must include 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.

MATERIAL

3. (a) The pedestrian signal heads must 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).

<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.	-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

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 must 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.
- (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 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.

LED OPTICAL UNIT

5. (a) LED Optical Unit. The light emitting diode (LED) optical unit must consist of a lens, reflector and lamp holder. 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) Light emitting diode (LED) optical units must consist of an integral unit containing the following components: power leads, housing, integral lens, matrix of light emitting diodes (LEDs) emitting monochromatic light of desired colors, and electronic and electrical components necessary to permit operation at nominal 120 volt, 60 hertz power.
- (c) The LED unit must 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.
- (d) Unit power supply must be constant current regulated and filtered to provide instant on indications, and to prevent momentary signal outages or flicker.
- (e) Units must consist of LEDs uniformly distributed to present a homogeneous appearance on the face of the lens from a wide viewing angle.
- (f) LEDs must be wired so that the loss of a single LED or a string of LEDs will not reduce the luminescence below the minimum requirement.
- (g) 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.
- (h) Units must be fully operable over a range of 90 volts to 130 volts at 60 hertz, plus or minus 3 hertz.
- (i) Surge protection. Each unit must be provided with integral surge protection to withstand transient of 600 volt, 100 microsecond rise and 1 millisecond pulse width. The surge protector must provide full electrical and physical protection to all unit components.
- (j) 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.

- (k) Units must be fully operable at temperature ranges of -40° F. (-40° C) to +165° F. (+74° C) at up to 100% relative humidity.
- (l) Units must be clearly marked on the back surface of the unit in a permanent manner showing information required for warranty and long term performance. Information to be shown must include manufacturer name, date of manufacture, electric power requirements, signal model type, and signal serial number.
- (m) The LED unit must be compatible with the traffic signal controller equipment currently in use by the City of Chicago, and meeting the City=s latest specifications for traffic signal control equipment. In particular the LED unit must be compatible with the NEMA TS-1 and later traffic signal load switches and conflict monitors.
- (n) 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.
- (o) Total harmonic distortion (THD) induced into the voltage and current AC power line sine waves must not exceed 20 percent.
- (p) 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) must conform in style and color to those of the "Institute of Transportation Engineers" (I.T.E.). The messages must be approximately 16 inches square and display the "Don't Walk" and "Walk" symbols. The symbols must 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 of lunar white, conforming to the specifications of the PTCSI.

LENS

- 7. 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

- 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-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, such as Marathon Special Products Corporation Catalog Number TB-304-SP, 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 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 must provide certified manufacturing and testing documentation to demonstrate that the pedestrian signals being supplied meet or exceed the specification requirements. Testing must be conducted by an independent and certified testing laboratory.
- (b) Inspection. The signals must be subject to inspection at the discretion of the Commissioner. Final inspection must be made at point of delivery. Any signal rejected must be removed and disposed of by the contractor at his sole cost.

PACKING

- 10. (a) Each pedestrian signal assembly must 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 must 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.

TRAFFIC SIGNAL MOUNTING BRACKET POLYCARBONATE, SIDE OF POLE

SCOPE

- 1. This specification states the requirements for polycarbonate brackets designed for mounting 12 inch traffic and pedestrian signal heads from the side of poles.

GENERAL REQUIREMENTS

- 2. (a) Sample and Certified Test Reports. One complete signal bracket of the

manufacture proposed to be furnished, must be submitted along with the required certified test reports, within fifteen (15) business days upon request of the Chief Procurement Officer. The sample must be delivered to the Engineer of Electricity, Bureau of Electricity, 2451 South Ashland Avenue, Chicago, Illinois 60608.

- (b) Standards. Equipment furnished under this specification must meet the appropriate requirements of the following standards, as required within the body of this specification:

American Association of State Highway and Transportation Officials (AASHTO)
American Society for Testing and Materials (ASTM)
Institute of Transportation Engineers (ITE)
National Electrical Manufacturers Association (NEMA)

- (c) Approval. Approval will mean approval in writing by the Commissioner or his/her duly authorized representative.
- (d) Warranty. The manufacturer must warrant the signal bracket to meet the requirements of this specification, and must warrant all equipment, components, parts and appurtenances against defective design, material and workmanship for a period of three (3) years from date of acceptance. In the event defects and failures become apparent during this period, the manufacturer must repair or replace such defects and failures at no expense to the City. This warranty must be evidenced by a letter or certificate of warranty submitted to the City at the time final delivery is made.

MATERIAL

3. (a) The bracket must be one piece, ultra violet stabilized polycarbonate resin of the specified color, injection molded complete with integral top, bottom, and sides.
- (b) The polycarbonate formulation used must provide these physical properties in the bracket (Tests may be performed on separately molded specimens).

<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.	-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.

LUMINAIRE: FLOODLIGHT FOR 250 WATT OR 400 WATT, HIGH PRESSURE SODIUM LAMP

SUBJECT

1. This specification states the requirements for a floodlight for lighting public areas. The floodlight has an integral ballast and electronic starter for a vertical burning 50,000 lumen, 400 watt, Type LU400 high pressure sodium lamp or a 26,000 lumen, 250 watt, Type LU250 high pressure sodium lamp. The floodlight can be mounted to a 1.9 to 3.0 inch tenon.

GENERAL

2. (a) Information Required. Each bidder must submit with his proposal the following information relative to the luminaire he proposes to furnish:
 1. Outline drawing.
 2. Complete description and weight.
 3. Candlepower distribution curve.
 4. Utilization efficiency charts.
 5. Luminaire efficiency.
 6. Projected area in square feet.
 7. Manufacturer's name and catalogue designation of the luminaire.
 8. IES formatted photometric curve in electronic format.
- (b) Sample. One completely assembled luminaire, with built-in ballast, of the manufacture intended to be furnished, must be submitted upon request of the Chief Procurement Officer within fifteen (15) business days of such request.
- (c) Assembly. Each luminaire must be delivered completely assembled, wired, and ready for installation; without the lamp or fuses. It must consist of aluminum housing, aluminum reflector, tempered flat glass refractor, refractor holder, lamp holder assembly, terminal board fuse block, ballast components, gaskets, slip fitter, and all necessary hardware.
- (d) 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 one (1) year after the luminaire has been placed in service. This will be interpreted particularly to mean compatible performance of ballast with lamps of various manufacture, failure of any ballast component, and loss of reflectivity of the reflecting surface. Any luminaire or part thereof, not performing as required, or developing defects within this warranty period must be replaced by the manufacturer without expense to the City.

CONSTRUCTION

3. (a) Weight and Area. The net weight of this luminaire with ballast must not exceed 60 pounds. The effective projected area must not exceed 3.0 square feet.

- (b) Housing. The housing must be a precision molded aluminum die casting. The wall thickness must be substantial and adequate to withstand the strains likely to be imposed on the housing when installed and in service. The housing must be hinged to allow access to the components. The opening between the two halves of the housing must be properly gasketed to provide a weather-tight seal upon closing. The two hinges must be at the bottom of the housing and must be held by cotterpins. At the top the two halves must be held together with two hex head screws.
- (c) Slip Fitter. The slip fitter must be suitable for attachment over the end of a two (2) inch steel pipe or tenon with a minimum of three (3) set screws for attachment. The slip fitter must be attached to the housing with bolts. The slip fitter must be designed with a knuckle joint to allow vertical positioning up to 90 degrees.
- (d) Lamp Holder Assembly. The lamp holder must be a mogul, porcelain enclosed socket having lamp grips, and must be a high quality commercial product, subject to approval. The lamp holder and its bracket must be assembled in the optical system, in such a manner that the optical system will be completely sealed. The optical system must be sealed from dust and moisture meeting IP65 standards.
- (e) Reflector. The reflector must be made of aluminum and polished to a highly specular "Alzak process" finish with suitable means for attachment to the housing. It must be of such design as to give proper re-direction of the light striking it with minimum reflection through the outer bulb of the lamp and must distribute the reflected light uniformly. The beam spread provided must meet NEMA requirements. The beam pattern must be 6 horizontal units by 7 vertical units unless otherwise directed.
- (f) Refractor. The refractor must be tempered, crystal clear, boro-silicate glass, well annealed, homogeneous, and free from imperfections and striations. It must be flat.
- (g) Gaskets. Wherever necessary, in order to make a completely dustproof optical assembly, gaskets of silicone rubber or other specifically approved material must be provided. The reflector gasket must fit around and over the flange of the reflector.
- (h) Hardware. All machine screws, locknuts, pins and set screws necessary to make a firm assembly, and for its secure attachment to the tenon, must be furnished in place. All hardware must be of stainless steel, copper silicon alloy or other non-corrosive metal, and where necessary must be suitably plated to prevent electrolytic action by contact with aluminum.
- (i) Fiberglass Tubing. Two lengths of fiberglass tubing with silicone varnish coating meeting requirements of National Electrical Manufacturers' Association insulation classification HC-2, Size 2 (0.263" I.D.), must be provided to permit proper thermal insulation of conductors ("LINE" leads) within the luminaire. They must be sufficiently long to extend from the terminal block to a point 6 inches beyond the end of the slip fitter.

- (j) Terminal Board-Fuse Block. A terminal board of molded phenolic plastic of the barrier type must be mounted within the housing in a readily accessible location. It must provide all terminals needed to completely prewire all luminaire components. The terminal board must either incorporate a barrier isolated section with fuse clips to take two "small-dimension" (13/32" x 1 1/2") cartridge fuses, or a separate barrier protected fuse block must be provided. The fuses are not required to be furnished with this luminaire. The fuse block must be wired to the appropriate terminals. The terminal board-fuse block must have plated copper or plated brass, clamp-type pressure terminals of an approved type for "line" connections, to accommodate wire sizes from #12 to #8 A.W.G. The terminals for connection of internal components must either be the screw-clamp or quick disconnect type.
- (k) Filter. The optical system must contain a charcoal "breathing" filter, of adequate size to provide effective filtering of particulate and gaseous contaminants.
- (l) Finish. The luminaire must have a baked on enamel finish. Color must be gray (Munsell No. 5BG 7.0/0.4 designated A.S.A. No. 70) or gloss black, as ordered. Surface texture and paint quality will be subject to approval. A paint chip sample must be submitted if requested.

BALLAST

- 4. (a) General. The integral ballast must be a multi-voltage tapped, high power factor, linear type, low loss reactor. It must accommodate input voltages of 120/208/240/277. The 400 watt floodlight ballast must be designed to furnish proper electrical characteristics for starting and operating a 400 watt high pressure sodium lamp at temperatures as low as minus 40°F. The 250 watt floodlight ballast must be designed to furnish proper electrical characteristics for starting and operating a 250 watt high pressure sodium lamp at temperatures as low as minus 40° F. 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.
- (b) Lamp Operation. The ballast must provide positive lamp ignition at an input voltage of 191 volts. It must operate the lamp over a range of input voltage from 191 to 220 volts without damage to the ballast for the 208 volt tap connection and 220 to 254 volts for the 240 volt tap connection. It must provide lamp operation within lamp specifications for rated lamp life at input voltage between 198 volts and 218 volts for the 208 volt tap connection and between 228 volts and 252 volts for the 240 volt tap connection.
- (c) Rating. The ballast must have properly coded wire leads for taps at rated input voltage of either 208 or 240 volts at 60 cycles, which must drive a nominal 100 volt lamp at 250 watts or 400 watts, depending on the fixture specified. The design range of input voltage for this ballast must be from +6% to -8% of the nominal voltage.
- (d) Lamp Current. The ballast must supply approximately 4.7 amperes to a 400 watt, 100 volt high pressure sodium lamp during operation, and not more than 7.0 amperes at starting for the 400 watt fixture. For the 250 watt fixture, the ballast

must supply approximately 2.2 amperes to a 250 watt, 100 volt high pressure sodium lamp during operation, and not more than 3.0 amperes at starting.

- (e) Power Factor. The power factor of the ballast over the design range of input voltages specified above must not be less than 90%.
- (f) Line Current. With nominal input voltage applied, the input current under starting, short circuit or open circuit condition, must not exceed 4.7 amperes rms.
- (g) Lamp Wattage. The 400 watt fixture ballast must deliver 400 watts to a nominal 100 volt lamp when operating at the nominal input voltage. The 250 watt fixture ballast must deliver 250 watts to a nominal 100 volt lamp at the nominal input voltage. Wattage input to the nominal lamp must not vary more than a total of 37% over the input voltage design range of 191 volts to 254 volts, with the supply connected to the proper ballast tap.
- (h) Ballast Loss. Wattage loss of the ballast must not exceed 43 watts.
- (i) Electronic Starter. The starter component must be comprised of solid state devices capable of withstanding ambient temperatures of 100°C. The starter must provide timed pulsing with sufficient follow-thru current to completely ionize and start all lamps. Minimum amplitude of the pulse must be 2,500 volts, with a width of one (1) microsecond at 2,250 volts, and must be applied within 20 electrical degrees of the peak of the open circuit voltage wave with a repetition rate of once each half cycle of the 60 cycle wave. The lamp peak pulse current must be a minimum of 0.5 amps. Proper ignition must be provided over a range of input voltage from 191 to 254 volts. The starter component must be field replaceable and completely interchangeable with no adjustment necessary for proper operation. The starter component must have push-on type electrical terminations which will provide good electrical and mechanical integrity with ease of replacement. The starter circuit board must be treated in an approved manner to provide a water and contaminant resistant coating.
- (j) Crest Factor. Maximum crest factor must be no greater than 1.65 over the input voltage range of 191 to 254 volts.
- (k) Mounting. The ballast components must be mounted and fastened 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.
- (l) Wiring. The lamp holder and ballast components must be completely wired, with connections made to a terminal board that will be suitable for both copper or aluminum supply conductors to provide the 208/240 volt tap connections. The reactor and capacitor leads must not be smaller than #16 gauge conductors. These must be insulated with an approved 125°C insulation. All leads must be coded in an approved manner for proper identification. A complete wiring diagram must be displayed at an easy to read location on the interior of the luminaire.
- (m) Capacitor. The capacitor must be a non-PCB, a-c power type. The capacitor can must be coated with a moisture resisting paint, or must be fabricated of

non-corrosive material.

- (n) Ballast. The ballast must be a tapped linear reactor device incorporating a molded polyester-glass bobbin structure having a precision wound, insulated, magnetic wire coil with bobbin mounted push-on type electrical terminations. These terminations must provide good electrical and mechanical integrity as well as easy ballast replacement. The ballast must be treated in an approved manner to provide electrical and mechanical protection.
- (o) Wiring Connection. The ballast panel wiring must be "plug" connected to lamp and line leads for easy disconnect in removing the ballast.

PACKAGING

- 5. (a) Packing. Each luminaire assembly must be packed in a suitable carton so secure that it will not be damaged in shipment and handling.
- (b) Marking. Each carton containing a luminaire must be clearly marked on the outside in letters not less than three-eighths (3/8) inch tall with the legend: "LUMINAIRE W/BALLAST, 400 WATT, HPS, FLOODLIGHT 6X7" or "LUMINAIRE W/BALLAST, 250 WATT, HPS, FLOODLIGHT 6X7", the appropriate City Commodity Code Number, the name of the manufacturer, the date of manufacture, and the contract number under which the luminaire is furnished.

LUMINAIRE: FOR 400 WATT, HIGH PRESSURE SODIUM LAMP; I.E.S. CUTOFF TYPE II/TYPE III DISTRIBUTION

SUBJECT

- 1. This specification states the requirements for a street lighting luminaire, with integral ballast and electronic starter, to provide power to a horizontal burning 50,000 lumen, 400 watt, Type LU400 high pressure sodium lamp. The luminaire must provide light distributions meeting I.E.S. cutoff Type II or Type III classifications. The luminaire must be able to be mounted to the end of a two inch pipe.

GENERAL

- 2. (a) Information Required. Each bidder must submit with his proposal the following information relative to the luminaires he proposes to furnish:
 - 1. Outline drawing.
 - 2. Complete description and weight.
 - 3. Candlepower distribution curve showing the light distribution in the 70 degree cone and in a vertical plane through the maximum beam.
 - 4. Isolux curves for the various socket positions.
 - 5. Utilization efficiency charts.
 - 6. Luminaire efficiency.
 - 7. Projected area in square feet.
 - 8. Manufacturer's name and catalogue designation of the luminaire.

9. IES formatted photometric curve in electronic format.
- (b) Sample. One completely assembled luminaire, with built-in ballast, of the manufacture intended to be furnished, must be submitted upon request of the Chief Procurement Officer within fifteen (15) business days of such request.
- (c) Assembly. Each luminaire must be delivered completely assembled, wired, and ready for installation; without the lamp or fuses. It must consist of aluminum housing, aluminum reflector, glass refractor, refractor holder, lamp holder assembly, terminal board-fuse block, ballast-door panel, ballast components, gaskets, slip fitter, and all necessary hardware.
- (d) 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 one (1) year after the luminaire has been placed in service. 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 reflecting surface, and discolorations or fogging of the refractor impairing the transmission of light. Any luminaire or part thereof, not performing as required, or developing defects within this period must be replaced by the manufacturer without expense to the City.

CONSTRUCTION

3. (a) Weight and Area. The net weight of this luminaire with ballast must be not more than 60 pounds. The projected area must not exceed 3.1 square feet.
- (b) Housing. The housing must be a precision molded aluminum die casting. The wall thickness must be substantial and adequate to withstand the strains likely to be imposed on the housing when installed and in service.
- (c) Slip Fitter. The slip fitter must be suitable for attachment over the end of a two (2) inch steel pipe with an approved means of clamping it firmly in place, and must provide a built-in pipe-stop. It may be integral with, or may be attached to, the housing. The slip fitter must be designed to permit adjustment of not less than three (3) degrees above and below the axis of the mounting bracket. The slip fitter must contain an approved shield around the pipe entrance to block entry of birds.
- (d) Lamp Holder Assembly. The lamp holder must be fully adjustable to accurately position the lamp. It must be a mogul, porcelain enclosed socket having lamp grips, and must be a high quality commercial product, subject to approval. The socket support bracket must provide both horizontal and vertical adjustments to achieve a broad range of light distribution patterns. Each adjustment position must be clearly marked, and the socket must be positively secured in each position. The lamp holder and its bracket must be assembled in the optical system, in a manner which provides a completely sealed, moisture and dust tight optical system.
- (e) Reflector. The reflector must be made of aluminum and polished to a highly specular "Alzak process" finish with suitable means for attachment to the housing. It must be of such design as to give proper re-direction of the light striking it with

minimum reflection through the outer bulb of the lamp and must distribute the reflected light to meet the desired I.E.S. light distribution. The desired light distribution must be I.E.S. cutoff Type II classification or I.E.S. cutoff Type III classification. The positioning of the socket support bracket will determine the light distribution.

- (f) Reflector. The reflector must be flat, crystal clear, heat-resistant, boro-silicate glass, well annealed, homogeneous, and free from imperfections and striations.
- (g) Reflector Holder. The reflector holder must be hinged to the luminaire housing and must open approximately 90 degrees to allow servicing of lamp and reflector. The reflector must be securely held in the reflector holder. In the closed position the reflector holder must cause the reflector to seat against the reflector gasket. The reflector holder must permit simple removal and replacement of the reflector without the use of tools. The hinge must prevent the reflector holder from disengaging and dropping in case it should swing open.
- (h) Latch. An approved latch must be provided for latching the reflector holder to the housing. The latch must be located opposite a suitable hinge, and in conjunction with the hinge must compress the gasket between the reflector and reflector. The latch must be a firm-gripping, easy opening, single action, positive latching type requiring no tools.
- (i) Ballast Door-Panel. The ballast components must be completely assembled and mounted on a die-cast aluminum door-panel. The door-panel must be hinged to the luminaire housing, suitably latched and fastened at the closing end; and it must be rapidly and simply removable. The hinge and fastening devices must be captive parts which will not become disengaged from the door panel.
- (j) Gaskets. Wherever necessary, in order to make a completely dustproof optical assembly, gaskets of silicone rubber or other specifically approved material must be provided. The reflector gasket must fit around and over the flange of the reflector.
- (k) Hardware. All machine screws, locknuts, pins and set screws necessary to make a firm assembly, and for its secure attachment to the mast arm, must be furnished in place. All hardware must be of stainless steel, copper silicon alloy or other non-corrosive metal, and where necessary must be suitably plated to prevent electrolytic action by contact with aluminum.
- (l) Fiberglass Tubing. Two lengths of fiberglass tubing with silicone varnish coating meeting requirements of National Electrical Manufacturers' Association insulation classification HC-2, Size 2 (0.263" I.D.), must be provided to permit proper thermal insulation of conductors ("LINE" leads) within the luminaire. They must be sufficiently long to extend from the terminal block to a point 6 inches beyond the end of the slip fitter.
- (m) Terminal Board-Fuse Block. A terminal board of molded phenolic plastic of the barrier type must be mounted within the housing in a readily accessible location. It must provide all terminals needed to completely prewire all luminaire components. The terminal board must either incorporate a barrier isolated section with fuse clips

to take two "small-dimension" (13/32" x 1 1/2") cartridge fuses, or a separate barrier protected fuse block must be provided. The fuses are not required to be furnished with this luminaire. The fuse block must be wired to the appropriate terminals. The terminal board-fuse block must have plated copper or plated brass, clamp-type pressure terminals of an approved type for "line" connections, to accommodate wire sizes from #12 to #8 A.W.G. The terminals for connection of internal components must either be the screw-clamp or quick disconnect type.

- (n) Filter. The optical system must contain a charcoal "breathing" filter, of adequate size to provide effective filtering of particulate and gaseous contaminants.
- (o) Finish. The luminaire must have a baked on enamel finish. Surface texture and paint quality will be subject to approval. Color must be gloss black or gray Munsell No. 5BG 7.0/0.4 (designated A.S.A. No. 70) as specified in the order. A paint chip must be submitted as a sample, upon request.

BALLAST

- 4. (a) General. The integral ballast must be a multi-voltage tapped, high power factor, linear type, low loss reactor. The input voltages available must be 120/208/240/277. It must be designed to furnish proper electrical characteristics for starting and operating a 400 watt high pressure sodium lamp at temperatures as low as minus 40°F. 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.
- (b) Lamp Operation. The ballast must provide positive lamp ignition at an input voltage of 191 volts. It must operate the lamp over a range of input voltages from 191 to 220 volts without damage to the ballast for the 208 volt tap connection and 220 to 254 volts for the 240 volt tap connection. It must provide lamp operation within lamp specifications for rated lamp life at input voltages between 198 volts and 218 volts for the 208 volt tap connection and between 228 volts and 252 volts for the 240 volt tap connection.
- (c) Rating. The ballast must have properly coded wire leads for taps at rated input voltages of either 208 or 240 volts at 60 cycles, which must drive a nominal 100 volt lamp at 400 watts. The design range of input voltage for this ballast must be from +6% to -8% of the nominal voltage.
- (d) Lamp Current. The ballast must supply approximately 4.7 amperes to a 400 watt, 100 volt high pressure sodium lamp during operation, and not more than 7.0 amperes at starting.
- (e) Power Factor. The power factor of the ballast over the design range of input voltages specified above must not be less than 90%.
- (f) Line Current. With nominal input voltage applied, the input current under starting, short circuit or open circuit condition, must not exceed 4.7 amperes rms.
- (g) Lamp Wattage. The ballast must deliver 400 watts to a nominal 100 volt lamp when operating at the nominal input voltage. Wattage input to the nominal lamp must not vary more than a total of 37% over the input voltage design range of 191

volts to 254 volts with the supply connected to the proper ballast tap.

- (h) Ballast Loss. Wattage loss of the ballast must not exceed 43 watts when delivering 400 watts to a nominal lamp at the nominal input voltage of 208 or 240 volts.
- (i) Electronic Starter. The starter component must be comprised of solid state devices capable of withstanding ambient temperatures of 100°C. The starter must provide timed pulsing with sufficient follow-thru current to completely ionize and start all lamps. Minimum amplitude of the pulse must be 2,500 volts, with a width of one (1) microsecond at 2,250 volts, and must be applied within 20 electrical degrees of the peak of the open circuit voltage wave with a repetition rate of once each half cycle of the 60 cycle wave. The lamp peak pulse current must be a minimum of 0.5 amps. Proper ignition must be provided over a range of input voltage from 191 to 254 volts. The starter component must be field replaceable and completely interchangeable with no adjustment necessary for proper operation. The starter component must have push-on type electrical terminations which must provide good electrical and mechanical integrity with ease of replacement. The starter circuit board must be treated in an approved manner to provide a water and contaminant resistant coating.
- (j) Crest Factor. Maximum crest factor must be no greater than 1.65 over the input voltage range of 191 to 254 volts for a nominal vertical burning lamp.
- (k) Mounting. The ballast components must be mounted and fastened on the luminaire ballast door panel 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.
- (l) Wiring. The lamp holder and ballast components must be completely wired, with connections made to a terminal board that must be suitable for both copper or aluminum supply conductors to provide the 208/240 volts tap connections. The reactor and capacitor leads must not be smaller than #16 gauge conductors. These must be insulated with an approved 125°C insulation. All leads must be coded in an approved manner for proper identification. A complete wiring diagram must be displayed at an easy to read location on the interior of the luminaire.
- (m) Capacitor. The capacitor must be a non-PCB, a-c power type. The capacitor can must be coated with a moisture resisting paint, or must be fabricated of non-corrosive material.
- (n) Ballast. The ballast must be tapped linear reactor device incorporating a molded polyester-glass bobbin structure having a precision wound, insulated, magnetic wire coil with bobbin mounted push-on type electrical terminations. These terminations must provide good electrical and mechanical integrity as well as easy ballast replacement. The ballast must be treated in an approved manner to provide electrical and mechanical protection.
- (o) Wiring Connection. The ballast panel wiring must be "plug" connected to lamp and line leads for easy disconnect in removing the ballast.

PACKAGING

5. (a) Packing. Each luminaire assembly must be packed in a suitable carton so secure that it will not be damaged in shipment and handling.
- (b) Marking. Each carton containing a luminaire must be clearly marked on the outside in letters not less than three-eighths (3/8) inch tall with the legend: "LUMINAIRE W/BALLAST, 400 WATT HP-SODIUM, CUTOFF, IES TYPE II/TYPE III", the appropriate City Commodity Code Number, the name of the manufacturer, and the contract number under which the luminaire is furnished.

LUMINAIRE: WITH BUILT-IN BALLAST: FOR VERTICAL BURNING 250 WATT HIGH PRESSURE SODIUM VAPOR LAMP: WITH TYPE V LIGHT DISTRIBUTION

INTENT

1. These specifications state the requirements for a street lighting luminaire, with built-in high power factor reactor ballast, for use with a vertical burning 250 watt high pressure sodium vapor lamp. The luminaire is to be mounted 15 to 25 feet above the roadway, attached to the end of a two-inch steel pipe. Luminaries furnished under this specification must be completely assembled and ready for installation by the City of Chicago.

GENERAL

2. (a) Information Required. Each bidder must submit with his proposal the following information pertaining to the luminaire he proposes to furnish:
1. Outline Drawing.
 2. Complete description and weight.
 3. Isocandela diagrams showing complete information necessary to determine available light distribution of the luminaire.
 4. Isofoot-candle diagrams.
 5. Co-efficient of utilization curves.
 6. Charts showing distribution of light flux from the luminaire.
 7. Projected area in square feet.
 8. Manufacturer's name and catalog description of the luminaire.
 9. Candlepower curves showing vertical distribution in the plane of maximum candlepower and lateral distribution in the cone of maximum candlepower.
 10. IES formatted photometric information in electronic format.
- (b) Approval. Wherever, "approval" and "approved" are used in this specification, they will mean a written approval by the Commissioner of Streets and Sanitation to be secured prior to proceeding with manufacture of these luminaries.
- (c) Sample. One completely assembled luminaire of the manufacture intended to be furnished must be submitted within fifteen (15) business days after receipt of a request from the Chief Procurement Officer. The sample luminaire must be delivered to the Bureau of Electricity facility at 2451 South Ashland Avenue, Chicago, Illinois in care of the Engineer of Electricity.

- (d) Warranty. The manufacturer must warrant every luminaire against defects due to design, workmanship, or material developing within a period of five (5) years after the luminaire has been placed in service. This will be interpreted particularly to mean failure of any ballast component, loss of reflectivity of reflecting surface, and discolorations or fogging of the refractor impairing the transmission of light. Any luminaire or part thereof developing defects within the period specified must be replaced by the manufacturer without expense to the City. The Commissioner of Streets and Sanitation will be the sole judge in determining which replacements are to be made, and his decision will be final

DETAIL REQUIREMENTS

3. (a) Housing. The housing must be a precision aluminum die-casting. The wall thickness must be substantial and adequate enough to withstand the strains likely to be imposed on the housing when installed and in service. The housing must enclose the slip-fitter, lamp socket, photo control receptacle, reflector or optical system hood-baffle, terminal board, fuse block, and ballast components, with provision for proper mounting of these parts. The housing must have provision on its top surface, or otherwise, to permit leveling with a spirit level. 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. Where a photo control receptacle is not required, the housing must be cast over the area where the photo control receptacle would normally be.
- (b) Assembly. Each luminaire must be delivered completely assembled, wired and ready for installation, but will not contain the lamp or fuses. Each luminaire must be complete with all components specified herein, including but not limited to aluminum housing, refractor, refractor holder, reflector or optical system hood-baffle, ballast components, terminal board-fuse block, lamp socket, photo control receptacle, gaskets, slip fitter and all necessary hardware.
- (c) Current Design. The luminaire must be the latest, up-to-date design and of modern styling, subject to approval.
- (d) Projected Area and Weight. The projected area of this luminaire must not exceed 2.0 square feet, and its weight must not exceed 35 pounds.
- (e) Slip-fitter. The slip-fitter must be suitable for attachment over the end of a one and a quarter inch (1 1/4") to 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 double 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 with an integral stair step level 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 must be set for a 2-inch pipe mounting. If the slip-fitter is built into the housing, it must be completely enclosed or partitioned off so that water and bugs will not enter the interior of the housing.

- (f) Lamp Socket. The mogul, multiple, porcelain enclosed lamp socket must be a high quality commercial product meeting ANSI C81.62-1991 standards. The socket must be UL and CSA certified. The socket must have integral lamp grips and a spring loaded center contact.

The socket must be rated for 2000 watts, 600 volts, with a 6KV pulse. To assure good mechanical and electrical connections, the lamp leads must be directly connected to the socket contacts by welded or indented compression connections.

- (g) Reflector. The optical system must be designed to perform properly and efficiently, with or without the use of a reflector. If a reflector is required for proper photometric performance, it must be of spun aluminum with a potassium silicate glass coating. 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 to provide a totally enclosed and completely dustproof optical assembly. A vulcanized ethylene-propylene diene monomer rubber gasket must be fixed in place to seal between reflector and refractor. A "breathing" filter of poly-felt or other approved material must be incorporated in the reflector. It must effectively filter-out dirt and particle size contaminants.

- (h) Refractor. The refractor must be molded, UV stabilized acrylic having a minimum cross-section of not less than 3/32" in thickness. It must contain prisms pressed on the inner and outer surfaces, and must be optically designed to direct by refraction the light from the lamp to produce vertical and lateral light distributions conforming to the desired I.E.S. classifications as elsewhere herein specified.

- (i) Hood-Baffle. If the luminaire is designed to meet photometric performance requirements without the use of a reflector, it must have an aluminum hood-baffle in lieu thereof, which will completely isolate the optical system from the surrounding atmosphere and serve as a separating baffle from the electrical components in the housing. If necessary to permit ready access to the interior of the housing, the hood-baffle will be hinged in an approved manner so as to be opened with the lamp in the socket. Closure must be accomplished by means of an easily opening spring clip or friction catch. The hood-baffle must be securely seated and positioned in order to provide proper mating with the refractor, and positive sealing of the optical system. A vulcanized ethylene-propylene diene monomer rubber gasket must be firmly cemented to the hood-baffle to provide a moisture and dust tight seal between the hood-baffle and refractor.

The socket mounting bracket may be attached to the hood-baffle. A "breathing" filter of poly-felt or other approved material must be incorporated in the hood-baffle. It must effectively filter out dirt and particle sized contaminants.

- (j) Refractor Holder-Door. The refractor holder-door must be a precision, aluminum die-casting which must be hinged to the luminaire housing, and must open downward approximately 90° to allow servicing of the lamp and access to electrical parts. The hinging arrangement must be of rugged construction with corrosion resistant hinge fittings. The complete door must be removable, and must have a safety feature to prevent accidental unhinging. The refractor must be securely held in the holder-door, yet must be easily removed by means of single-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 must 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.

If separate door is provided for access to electrical parts enclosed in the housing, it, too, must be a precision aluminum die-casting of rugged construction and conform to the same hinging requirements as the refractor holder-door, except that method of latching and locking this auxiliary door will be subject to approval.

A large letter "C" must be cast into the bottom portion of the refractor holder-door or access door which encloses the ballast and electrical wiring. This embossed letter must be visible and identifiable from the ground when the luminaire is mounted at a 25-foot height.

- (k) Terminal Board-Fuse Block. A terminal board of high grade molded plastic or glazed porcelain of the barrier or safety type must be mounted within the housing in a readily accessible location. It must provide all terminals needed to completely prewire all luminaire components. The terminal board must either incorporate a barrier isolated section with fuse clips to take a "small-dimension" cartridge fuse, or a separate barrier protected fuse block must be provided. It must be UL and CSA certified. The terminal block must be able to pass a 5000 volt hipot terminal to ground and terminal to terminal.

The fuse is not required to be furnished. The fuse block must be wired to the appropriate terminals. The terminal board-fuse block must have plated copper or plated brass, clamp-type pressure terminals of an approved type for "line" connections, to accommodate wire sizes from #12 to #8 A.W.G. The terminals for connection of internal components must be either the screw-clamp or quick disconnect type.

- (l) Photo-control Receptacle and Cap. If the contract calls for photo-control, a standard three-prong, twist lock receptacle for a photo-control meeting ANSI standard C136.10-1988 must be mounted in the housing with provision for proper positioning of the photo-control. The receptacle must be able to be repositioned without the use of tools. The photo-control is not required to be furnished, but a shorting cap with a three-prong plug having line-load prongs shorted together and meeting ANSI standard C136.10-1988 must be provided. If the contract calls for no photo-control capability, no receptacle will be provided and the housing casting must be cast over where the photo-control would normally be.

- (m) Reflector or Hood-Baffle Gasket. This gasket must be vulcanized ethylene-propylene diene monomer rubber (EPDM) of an approved cross-section. Felt gaskets are not acceptable.

- (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 must 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.

- (o) Finish. The luminaire must have a light electrocoat gray enamel baked on finish. The paint color must meet standard ASTM D2244. Paint adhesion must meet standard ASTM D3359 5B. The finish must withstand up to 1000 hours of salt fog per standard ASTM B117 with creep not exceeding 1/8" from the scribe and blisters not exceeding No. 8 medium per ASTM D714. When scribed, the humidity resistance of the finish must meet standard ASTM 2247 without blistering or peeling. The flexibility of the finish must meet standard ASTM D522; the finish must demonstrate no cracking beyond 1/4" from the apex of cone. The finish must demonstrate a pencil hardness of H per ASTM D3363. The finish must resist an impact of 4 in.-lbs. Reverse and 28 in.-lbs. Direct impact per standard ASTM D2794.

BALLAST REQUIREMENTS

- 4. (a) General. The built-in-ballast must be a high power factor, constant wattage autoregulator (CWA-lead type regulator). It must be designed to furnish proper electrical characteristics for starting and operating a 250 watt high pressure sodium lamp at temperatures as low as minus 40° C. The ballast winding must be adequately impregnated and treated for protection against the entrance of moisture, insulated with Class N insulation, and be able to withstand the ANSI standard dielectric test. The ballast must include an encapsulated electronic starting component.

The ballast must have precision wound coils on molded bobbins assembled on steel welded coils. All terminations must be positive contact of the push on type. No twist connectors are allowed. All ballasts must meet ANSI standards C136.2-1996.

- (b) Lamp Operation. The ballast must provide positive lamp ignition at an input voltage of 95 volts. It must operate the lamp over a range of input voltage from 95 to 132 volts without damage to the ballast. It must provide lamp operation within lamp specifications for rated lamp life at input voltages between 108 volts and 132 volts.
- (c) Rating. The ballast must have properly coded wire leads for rated input voltage of 120 volts at 60 cycles, which must drive a nominal 100 volt lamp at 250 watts. The design range of input voltage for this ballast must be from + 10 to -10% of the nominal voltage (120 volts).
- (d) Lamp Current. The ballast must supply approximately 3.0 amperes to a 250 watt, 100 volt high pressure sodium lamp during operation, and not more than 4.7 amperes at starting.
- (e) Power Factor. The power factor of the ballast over the design range of input voltages specified above must not be less than 90%.
- (f) Line Current. With nominal input voltage applied, the input current under starting, short circuit or open circuit condition, must not exceed 2.6 amperes.
- (g) Lamp Wattage. The ballast must deliver 250 watts to a vertical burning nominal (100 volt) lamp when operating at the nominal (120 volt) input voltage. Wattage input to the nominal (100 volt) lamp must not vary more than a total of 25% over the input voltage design range of 108 volts to 132 volts.

- (h) Ballast Loss. Wattage loss of the ballast must not exceed 60 watts when delivering 250 watts to a nominal (100 volt) lamp at the nominal input (120 volt) voltage. The wattage loss must be measured with a nominal 100 volt lamp Acold on the bench@.
- (i) 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.
- (j) Electronic Starter. The starter component must be a solid state device capable of withstanding ambient temperatures of 100° C. The starter must provide timed pulsing with sufficient follow current to start the lamp. Minimum amplitude of the pulse must be 2,500 volts, with a minimum width of one (1) micro-second at 90% of peak, and must be applied within 20 electrical degrees of the peak of the open circuit voltage wave with a repetition rate of once each half cycle of a 60 cycle wave. Proper starting must be provided over a range of input voltage from 95 volts to 132 volts. The starter circuit-board must be encapsulated in an approved manner.
- (k) Crest Factor. Current crest factor must not be greater than 1.8 at nominal input voltage for a nominal vertical burning lamp.
- (l) Mounting. The ballast components must be mounted and fastened within the luminaire housing 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.
- (m) Wiring. The lampholder and ballast components must be completely wired, with connections made to an approved terminal board. The ballast and capacitor leads must not be smaller than #16 gauge conductors. These leads must be insulated with an approved class of insulation. All wiring passing through the reflector must be grommited. All leads must be coded in an approved manner for proper identification. A complete wiring diagram must be displayed at a convenient location on the interior of the luminaire.
- (n) Capacitor. The capacitor must be an A.C. paper-oil, power capacitor. The capacitor must be coated with a moisture resisting paint, or must be fabricated of non-corrosive material.
- (o) Noise Level. The noise level of this ballast must be such that when installed in the luminaire and operating, no objectionable audible noise will be detected from directly beneath the luminaire, when field tested in a residential neighborhood, and mounted on a steel pole at the end of an 8-foot steel arm at a 16 foot light center height.
- (p) 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. The fixture must pass heat and moisture tests, as certified by an independent lab. The fixture must be able to withstand 1.5 G vibration for 100,000 cycles in each of three major axes and 3.0 G vibration for 5,000 cycles on the worst axis as per proposed standard ASTM C136.31.

PHOTOMETRIC PERFORMANCE

5. (a) Light Distribution. The luminaire provided must be capable of standard I.E.S. Type V distribution.
- (b) Efficiency of the Luminaire. Light flux emitted by this luminaire with a 250 watt, high pressure sodium lamp providing the IES Type V distribution must not be less than the following:

	<u>LUMENS</u>	<u>PERCENT OF LUMENS</u>
Downward - Street Side	9240	33
Downward - House Side	<u>9240</u>	<u>33</u>
Totals:	18480	66

And not more than

Upward - Street Side	840	3
Upward - House Side	<u>840</u>	<u>3</u>
Totals:	1680	6

Total efficiency must not be less than 70%.

- (c) Average Illumination. The average initial horizontal illumination for the entire area represented by a 66 foot wide "right-of-way" of 110 foot length with two luminaires contributing, and operating a 250 watt high pressure sodium lamp at a 21.5-foot light center height, and providing the IES Type V distribution designated above, must not be less than 0.58 foot candles.
- (d) Illumination Uniformity. Based on initial horizontal illumination provided by this luminaire for the conditions specified in paragraph (c) in the preceding paragraph, the uniformity ratios must not be greater than the following:

<u>Ratio</u>	For the Complete 66' <u>Right-of-way</u>
Avg. - Min.	4 to 1
Max. - Avg.	2.5 to 1

- (e) Brightness Control. Prismatic shielding must provide effective luminaire brightness control to street side and house side, such that luminance values for the indicated viewing angles must not exceed the values indicated below, when tested as follows:

1. Test Measurements. Brightness measurements (luminance) in candles per

square inch must be made for the projected area of the luminaire refractor burning a 250 watt high pressure sodium lamp from two apparent viewing positions (one for "house side" and one for "street side").

2. Instrumentation. The instrument to be used to make the luminance measurements must consist of a three foot (3') long tube large enough in diameter to accommodate a color corrected WESTON photocell at one end and having one-inch-square aperture at the opposite end, and covered on the inside surface with black velvet. A WESTON #622 micro ammeter must be calibrated with a reference standard of known luminance, and must be used to measure the cell response. A scanning fixture must be used to fix the position of the instrument's angle settings. It must also provide for vertical and horizontal "tracking" of the instrument "plumb" over the required ranges of traverse.
3. Test Procedure. With the luminaire oriented to provide its normal distribution pattern, the instrument must be set so that a plane through the vertical axis of the luminaire and the axis of the tube must conform to required lateral (clockwise) angle with respect to the 0° (across street) reference, the tube must be inclined in this plane at the specified vertical angle from nadir, with the aperture of the tube placed as close to the refractor as possible. Starting from one side, the uppermost one-inch luminous strip must be scanned-across and measurements taken at contiguous one-inch increments, without overlapping. Only full one-inch-square readings must be recorded. Successive horizontal scans must be made by lowering the complete instrument on its vertical axis an amount necessary to cover each luminous strip of the refractor without overlap.
4. Luminance Values. Luminance values for this luminaire must not exceed the values listed below:

Vertical Angle (from Nadir)	Luminance (Cd/sq.M.)		
	Average 0 Degrees	Average 0 Degrees	Average 0 Degrees
45°	1362	1362	1362
55°	1624	1624	1624
65°	1526	1526	1526
75°	1080	1080	1080
85°	422	422	422

PACKAGING

6. (a) Each luminaire must be packed in a suitable carton, so secured that the unit will not be damaged during shipment, handling, or storage.
- (b) Each luminaire must be clearly marked on the outside in letters not less than 3/8 of an inch tall with the legend ACRIMEFIGHTER LUMINAIRE: 250 WATT HPS,

TYPE V@, the name of the manufacturer, the contract number, the City commodity code, and the date of manufacture.

LAMPS: HIGH PRESSURE SODIUM FOR STREET LIGHTING

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

1. 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 owner, 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 owner.

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 owner. 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.

NON-METALLIC CONDUIT

SCOPE

1. This specification states the requirements for both rigid and coilable non-metallic conduit. The conduit will be used for low voltage (600 volt rated cables) electrical street lighting and traffic control systems. It may also be used for fiber-optic communications cables. This conduit will be installed underground. Rigid non-metallic conduit may be installed on structure.

GENERAL

2. (a) Standards. The following standards are referenced herein.

ASTM – American Society for Testing and Materials
NEC – National Electrical Code
NEMA – National Electrical Manufacturer's Association
UL – Underwriter's Laboratories

- (b) Warranty. The manufacturer must warrant the conduit against defective workmanship and material for a period of one year from date of installation or date of delivery. Any conduit that is found to be defective must be replaced without cost to the City.

- (c) Sample. If requested by the Chief Procurement Officer, a sample of the conduit intended to be furnished under this specification, must be submitted to the Engineer of Electricity within fifteen (15) business days upon receipt of such request.

MATERIAL

2. (a) Rigid non-metallic conduit will be made of polyvinyl chloride (PVC). All conduit and fittings must comply with ASTM D 1784 and with the applicable sections of NEMA TC2, UL standard 651, and NEC Article 347. Fittings must meet the standards of NEMA TC3 and TC6, as well as UL 514.
- (b) Coilable non-metallic conduit will be made of high density polyethylene (HDPE). All conduit must comply with ASTM D3485 ,ASTM D 1248, and NEMA TC7.

SIZES

3. (a) PVC and HDPE will come in two wall thicknesses; schedule 40 and schedule 80.
(b) PVC will come in ten foot sections. HDPE will come on reels.
- (c) Nominal inside diameters (in inches) for non-metallic conduits will include the following: ½ , ¾ , 1, 1 ¼, 1 ½ , 2, 2 ½ , 3, 3 ½, 4.

PACKING

4. Rigid conduit must be shipped in bundles. Coilable conduit must come on wooden reels. Both bundles and reels must be tagged to indicate the size and diameter of the conduit, the quantity in feet, the weight, and the manufacturer's name. The conduit itself must be marked to indicate the type and size, as well as the manufacturer.

CABLE: SINGLE-CONDUCTOR, COPPER 600 VOLT

SUBJECT

1. This specification states the requirements for cables intended to be used as conductors in 120/240 VAC, 60 cycle, single phase, street lighting circuits. The cables will be installed in underground ducts or conduit.

GENERAL

2. (a) Specifications. The cable must conform in detail to the requirements herein stated, and to the applicable portions of the latest revisions of the specifications and methods of test of the following agencies:
- (1) ICEA Specification S-95-658
 - (2) IEEE Standard 383
 - (3) ASTM Standard E662-06
 - (4) ASTM Standard D470-05
 - (5) U.L. 44

- (6) U.L. 854
- (b) Acceptance. Cable not in accordance with this specification will not be accepted.
- (c) Sample. If requested by the Chief Procurement Officer, a three (3) foot sample of the cable intended to be provided under this specification must be sent to the attention of the Engineer of Electricity within fifteen (15) days of receipt of such request.
- (d) Warranty. The manufacturer must warrant the cable to be first class material throughout. In lieu of other claims against them, if the cables are installed within twelve (12) months of date of shipment, the manufacturer must replace any cable failing during normal and proper use within two years of date of installation. All replacements under this warranty must be made free of charge F.O.B. delivery point of the original contract.

CONSTRUCTION

3. This cable must consist of a round copper conductor with a tight fitting, free stripping, concentric layer of ethylene propylene (EPR) insulation and a concentric low lead chlorosulfonated polyethylene (CSPE) jacket extruded in tandem with, and bonded to, the insulation, or ethylene propylene (EPR) insulation only. The cable must be rated for continuous duty in wet or dry conditions at 90° C operating temperature, 130° C emergency overload temperature and 250° C short circuit temperature.

CONDUCTOR

4. (a) Material. The conductor must either be soft or annealed round copper wire.
- (b) Specifications. The conductor must meet the requirements of ASTM B3, B8 or B258, as applicable.
- (c) Sizes. The conductor size must be as stated in the PROPOSAL and in accordance with all requirements in Table A of this specification.
- (d) Stranding. The number of strands, must be as indicted in Table A. Stranding must meet the requirements of ASTM B8, Class B.

INSULATION

5. (a) Type. The insulation must be ethylene propylene rubber compound meeting the physical and electrical requirements specified herein.
- (b) Thickness. The insulation must be circular in cross-section, concentric to the conductor, and must have an average thickness not less than that set forth in Table A of this specification, and a spot thickness not less than ninety percent (90%) of the average thickness.
- (c) Initial Physical Requirements:

1. Tensile strength, min., psi. 1,200

2. Elongation at rupture, min. % 250

(d) Air Oven Exposure Test. After conditioning in an air oven at 121 +/- 1°C for 168 hours using methods of test described in ASTM-D 573:

Tensile strength, minimum percent of unaged value.....75
Elongation at rupture, minimum percent of unaged value.....75

(e) Mechanical Water Absorption:

GRAVIMETRIC METHOD: After 168 hours in water at 70+/- 1°C:
water absorption, maximum, milligrams per square inch.....5

(f) Cold Bend Test Requirements. The completed cable must pass the "Cold-Bend, Long-Time Voltage Test on Short Specimens" of ASTM D-470 except that the test temperature must be minus (-) 25°C.

(g) Electrical Requirements

1. Voltage Test. The completed cable must meet an A.C. and D.C. voltage test in accordance with ASTM D-470 and D-2655.

2. Insulation Resistance. The completed cable must have an insulation resistance constant of not less than 20,000 when tested in accordance with methods shown in ASTM D-470.

JACKET

6. (a) Type. If the cable is jacketed, the jacket must be a chlorosulfonated polyethylene (CSPE) compound meeting the physical and electrical requirements specified herein. The CSPE jacket must meet CFR Title 40, Part 261, for leachable lead.

(b) Thickness. The jacket must be circular in cross-section, concentric with the insulation, must have an average thickness not less than that set forth in Table A of this specification and a spot thickness not less than ninety percent (90%) of the average thickness.

(c) Initial Physical Requirements:

1. Tensile strength minimum PSI 1800
2. Elongation at rupture, minimum percent 300

(d) Air Oven Exposure Test. After conditioning in an air oven at 121 +/- 1°C for 168 hours:

1. Tensile strength, minimum percent of unaged value 75
2. Elongation at rupture, minimum percent of unaged value 60

(e) Mechanical Water Absorption. After 168 hours at 70 +/- 1°C:

1. Milligrams per square inch, maximum 20

TESTING

7. (a) General. Tests must be performed on insulation, jacket and completed cables in accordance with applicable standards as listed in these specifications. Where standards are at variance with each other or with other portions of this specification, the most stringent requirements, as determined by an engineer from the Bureau of Electricity, will apply. All tests must be conducted on cable produced for this order. Where cable insulation and/or jacket thickness preclude obtaining samples of sufficient size for testing, special arrangements must be made with the engineer to obtain samples of unprocessed materials directly from the extrusion feed bins which will be separately processed and prepared for tests.
- (b) Number of Tests. Insulation and jacket tests must be conducted on samples taken every 25,000 feet or fraction thereof of each conductor size. In no case must samples be taken closer than 15,000 feet apart.
- (c) Witness Tests. Where the quantity of cable on a single purchase order is 250,000 feet or more, all insulation and jacket tests must be witnessed by an engineer from the Bureau of Electricity, if so requested by the City. Included in these tests will be a 70,000 BTU per hour flame test in accordance with IEEE 383. Reels to be tested will be selected at random. The contractor must include in his bid, the cost of travel, food and lodging for one (1) engineer. Travel for 150 miles or greater must utilize a major airline. Lodging accommodations must be equal to those provided at a Holiday Inn. The engineer must be given ten (10) working days notice of all travel arrangements.
- (d) Test Reports. No cable may be shipped until certified copies of all factory tests, including witness tests where applicable, have been reviewed and approved by the engineer.
- (e) Acceptance. Samples must be taken from each reel and must successfully conform to all tests specified herein. Reels from which samples fail to conform, will be rejected.

PACKAGING

8. (a) Cable Marking. The cable must be identified by a permanently inscribed legend in white lettering as follows:

1/c No. (conductor size) AWG-600V-90°C-EPR or EPR/CSPE

The legend must be repeated at approximately eighteen (18) inch intervals on the outside surface of the cable parallel to the longitudinal axis of the conductor. A sequential footage marking must be located on the opposite side from the legend.

- (b) All cable will be black pigmented. When three conductors (triplex) are specified, one conductor will be black, another will be red or black with a red tracer, the smaller of the conductors must have a green colored jacket and the three conductors must be triplexed with a 16"-18" lay. The insulation color must not be unduly affected by cable installation, or prolonged exposure to either direct sunlight or moisture. Where the quantity of triplex cable exceeds 80,000 feet, witness

testing as outlined in section 7(c) will apply.

- (c) Reels. The completed cable must be delivered on sound substantial, non-returnable reels. Both ends of each length of cable must be properly sealed against the entrance of moisture and other foreign matter by the use of clamp-on cable caps, such as the Reliable Electric Company neoprene cable cap No. 1405, or equal. The ends must be securely fastened so as not to become loose in transit. Before shipment, all reels must be wrapped with cardboard or other approved wrapping.
- (d) Footage. Each reel must contain the length of cable as set forth in Table A of this specification. Alternate lengths may be considered.
- (e) Reel Marking. A metal tag must be securely attached to each reel indicating the reel number, contract number, date of shipment, gross and tare weights, description of the cable, the total footage, and the beginning and ending sequential footage numbers. Directions for unrolling the cable must be placed on the reel with an approved permanent marking material such as oil-based paint or a securely attached metal tag.

TABLE "A"

CONDUCTOR		INSULATION/JACKET THICKNESS		A-C TEST	REEL LENGTH
<u>AWG</u>	<u>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

CABLE: TRAFFIC SIGNAL, MULTIPLE CONDUCTOR, COPPER WIRE, 600 VOLT

SUBJECT

1. This specification states the requirements for a multiple cable to be installed in underground conduits and used to distribute electrical energy to operate automatic traffic control equipment at street intersections within the City of Chicago. The cable will be used between the traffic controller cabinet and the junction boxes on the traffic signal poles.

GENERAL

2. (a) Specification. The cable must conform in detail to the requirements herein stated, and to the specifications and methods of test of the following:

ASTM - American Society for Testing and Materials
ICEA - Insulated Cable Engineers Association
IEEE - Institute of Electrical and Electronic Engineers
UL - Underwriters Laboratories
- (b) Acceptance. Cable not conforming to this specification will not be accepted.
- (c) Sample. If requested by the Chief Procurement Officer, a three (3) foot sample of the cable intended to be furnished under this specification must be submitted to the attention of the Engineer of Electricity within fifteen (15) business days of receipt of such request.
- (d) Warranty. The manufacturer must warrant the cable to be first class material throughout. In addition to any other claims against them, if the cable is installed within six months of date of shipment, the manufacturer must replace any cable failing during normal and proper use within two years of date of installation. All replacements under this warranty must be made free of charge F.O.B. delivery point of the original contract.

CABLES

3. (a) Construction. The cable must meet the requirements of ICEA standard S-95-658 and UL 44 for cable. The cable must consist of coated conductors each concentrically encased with a "free-stripping", ethylene propylene, insulation. In two-conductor cables, the insulated and covered conductors must be parallel and not twisted, with suitable filler, as necessary, to produce a flat core of minimum practicable dimensions. In the larger count cables suitable fillers must be used to produce an essentially round cross-section. A Mylar tape must be wrapped over the conductor assembly, and a low smoke zero halogen polyolefin (LSZH) or chlorosulfonated polyethylene (CSPE) jacket applied overall.
- (b) Outer Diameter. The maximum allowable outer diameter for round cables must be as follows:

<u>No. Of Conductors</u>	<u>Outer Diameter</u> (inches)
--------------------------	-----------------------------------

Seven	0.49
Ten	0.69
Nineteen	0.90

- (c) Sealing. Both ends of each length of cable must be thoroughly sealed to prevent the entrance of moisture and other foreign matter.

COLOR CODE

4. Conductor identification must be provided by color synthetic-resin coverings, or an approved equal. Table A sets forth the color code for the various conductor arrangements.

CONDUCTOR

5. (a) Material. Round, soft or annealed, copper wire, meeting the requirements of ASTM B-3 and B-8, and coated in accordance with ASTM B33.
- (b) Size. Cables must be made up of conductor sizes as set forth in this specification. The Number 14 AWG will be solid. Number 4 AWG conductors will be stranded.

INSULATION

6. (a) Type. The insulation must be an ethylene propylene compound meeting the physical and electrical requirements herein specified when tested in accordance with ASTM D-470-81.
- (b) Thickness. The insulation must be circular in cross-section and have the following minimum thicknesses.

<u>Conductor Size. AWG</u>	<u>stranding (No. Of Wires)</u>	<u>No. of Conductors</u>	<u>Insulation Thickness (mils)</u>
#4	7	2	45
#14	1	7	30
#14	1	10	30
#14	1	19	30

- (c) Physical Properties. Initial Value.

Tensile Strength	1200 psi minimum
Elongation at Rupture	250% minimum

- (d) Physical Properties. After Aging.

After 168 hours in air oven at 121° Centigrade:

Tensile Strength	75% of initial value
Elongation	75% of initial value

- (e) Accelerated Water Absorption Characteristics. Test must be made in accordance

with methods discussed ASTM D470.

Gravimetric Method. The insulation must not absorb more than five (5) milligrams of water per square inch of exposed surface area after immersion in distilled water at 70° Centigrade for a period of seven (7) days.

- (f) Cold-Bend Test Requirements. The completed cable must pass the "Cold" B end, Long-Time Voltage Test on Short Specimens" of ASTM D470 except that the test temperature must be minus (-) 25° Centigrade.
- (g) Electrical Requirements.
 - (1) Voltage Test. The completed cable must meet an A.C. and D.C. voltage test in accordance with ASTM D470 and D2655.
 - (2) Insulation Resistance. The completed cable must have an insulation resistance constant of not less than 20,000 when tested in accordance with methods shown in ASTM D470.

CABLE TAPE

- 7. The assembled and cabled conductor core must be wrapped with a one mil (0.001 inch) thick Mylar tape allowing a minimum of ten percent (10%) overlap.

JACKET

- 8. (a) Material. The jacket must be either a heavy duty low smoke zero halogen (LSZH) polyolefin or low lead chlorosulfonated polyethylene (CSPE) meeting the physical and electrical requirements specified herein. CSPE must meet the requirements of CFR Title 40, Part 261 for leachable lead.
- (b) Workmanship. The jacket must have a smooth exterior surface free from holes, cracks and splits, and must be tough, elastic, homogeneous in composition, and properly vulcanized.
- (c) Thickness. Average thicknesses of the jacket must be not less than that given below. Minimum thickness must be not less than ninety percent (90%) of the average thickness.
 - (1) Two-Conductor # 4 AWG 5/64 inch
 - (2) Seven-Conductor 3/64 inch
 - (3) Ten-Conductor 4/64 inch
 - (4) Nineteen-Conductor 4/64 inch
- (d) Initial Physical Requirements:
 - 1. Tensile strength minimum PSI 1800
 - 2. Elongation at rupture, minimum percent 300
- (e) Air Oven Exposure Test. After conditioning in an air oven at 121° ± 1°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 Bureau of Electricity, will apply.
- (b) Number of Tests. Insulation and jacket tests must be conducted on samples taken every 25,000 feet or fraction thereof of each conductor size. In no case must samples be taken closer than 15,000 feet apart.
- (c) Witness Tests. Where the quantity of cable on a single purchase order is 250,000 feet or more, all insulation and jacket tests must be witnessed by an engineer from the Bureau of Electricity, if so requested by the City. Included in these tests will be a 70,000 BTU per hour flame tests in accordance with IEEE 383. Reels to be tested will selected a random. The contractor must include in his bid, the coast of travel, food and lodging for one (1) engineer. Travel for 150 miles or greater must utilize a major airline. Lodging accommodations must be equal to those provided at a Holiday Inn. The engineer must be given ten (10) working days notice of all travel arrangements.
- (d) Test Reports. No cable may be shipped until certified copies of all factory tests, including witness tests where applicable, have been reviewed and approved by the engineer.
- (e) Acceptance. Samples must be taken from each reel and must successfully conform to all tests specified herein. Reels from which samples fail to conform, will be rejected.

PACKAGING

10. (a) Reels. The completed cable must be delivered on sound substantial, nonreturnable reels. Both ends of each length of cable must be properly sealed against the entrance of moisture and other foreign matter by the use of clamp-on cable caps, such as the Reliable Electric Company neoprene cable cap No. 1405, or equal. The ends must be securely fastened so as not to become loose in transit. Before shipment, complete 2 x 4 lugging 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

Base Color	First Tracer	Second Tracer	2 (# 4)	7	10	19
Green	White	--	--	--	--	14
Blue	White	--	--	--	--	14
Orange	White	--	--	--	--	14
White	Red	--	--	--	--	--
Blue	Orange	--	--	--	--	14
Red	Blue	--	--	--	--	14
Green	Blue	--	--	--	--	14
Orange	Blue	--	--	--	--	14

TRAFFIC SIGNAL: OPTICALLY PROGRAMMED, TWELVE INCH SINGLE FACE, SINGLE OR MULTIPLE SECTION, LED

SUBJECT

1. This specification states the requirements for optically programmed, twelve-inch, single face, single and multiple-section, electric traffic signals with aluminum housings for use in the traffic control system of the City of Chicago.

GENERAL REQUIREMENTS

2. (a) Sample and Certified Test Reports. One complete signal, fully assembled and wired, of the manufacture proposed to be furnished, must be submitted along with the required certified test reports, within fifteen (15) business days upon request of the Chief Procurement Officer. The sample must be delivered to the Engineer of Electricity, Bureau of Electricity, 2451 South Ashland Avenue, Chicago, Illinois 60608.
- (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)
 - Underwriters Laboratories (UL)
- (c) The traffic signal heads must conform to ITE Standard "Vehicle Traffic Control Signal Heads" (VTCSH), in which the most recently published revisions will govern.
- (d) Approval. Approval will mean approval in writing by the Commissioner or his/her duly authorized representative.

HOUSING REQUIREMENTS

3. (a) Housing. The housing of each section must be one piece, cast aluminum, complete with integral top, bottom, and sides. The aluminum die casting material must meet or exceed the ITE alloy composition and tensile strength requirements. The housing must be prepared with chromate treatment primer and painted with two coats of enamel in color as specified in the line item or contract plans.
- (b) Assembly. A traffic signal section must be comprised of, but not limited to, the housing, hinged front and rear doors, visor, optical unit and all necessary gaskets and hardware. The multi-section, single face, traffic signal must be comprised of single face single sections assembled together, containing an internally mounted terminal block. Arrow indications must be shipped as single sections. The traffic signals must be designed and constructed to permit sections to be assembled together, one above the other, forming a weatherproof and dust-tight unit. Each housing must be equipped with holes to be used for mounting backplates.
- (c) Individual sections must be fastened together with adjustable coupling assemblies which lock the individual sections together. The assembly must allow the incremental tilting of the signal faces +/- 10 degrees from horizontal while maintaining a common vertical axis for the sections. The hole in the coupling assembly must accommodate three 3/4 inch cables.
- (d) Height. The overall height of an assembled traffic signal must be fourteen (14) inches for a single-section signal, forty-two (42) inches for a three-section signal, and seventy (70) inches for a five-section, plus or minus one (1) inch.
- (e) Mounting. The traffic signal must be designed for mounting with standard traffic signal brackets using 1-1/2 inch pipe size fittings.
- (f) Positioning Device. The top and bottom opening of each housing must have integral serrated bosses that will provide positive positioning of the signal head in five degree increments. A total of 72 teeth must be provided in the serrated bosses to allow the signal face to be rotated 360 degrees about its axis. The teeth must be clean and well defined to provide positive positioning.
- (g) Hinges. The signal housing must be sectional; one section for each optical unit. Each housing must have four integral hinge lugs, with stainless steel hinge pins (AISI 304 or equivalent), located on the left side for mounting the front door and on the right side for the rear 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 of the front door and one bolt lug on the left side of the rear door. Each closure must consist of 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 and must provide for opening and closing the door without the use of tools.
- (h) Front and Rear Doors. The doors must be one piece die cast aluminum construction. The front door must house the objective lens and allow access to the optical-limiter diffuser. 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 front door. The front door must be prepared with chromate treatment primer and painted with two coats of flat black enamel. The rear door must allow access to the lamp. Two (2) hinge lugs on the right side and one (1) set of latch screw jaws centered on the left side, as viewed from the rear of the signal, must be integrally cast with the housing rear door. The rear door must be prepared with chromate treatment primer and painted with two coats of enamel in color matching the signal housing. The doors must be hinged to the housing with two (2) stainless steel hinge pins, drive fitted. The inside of the doors 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.

- (i) 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 must be provided.
- (j) Visor. Each traffic signal must have a visor for each signal indication (section). The visor must be the cutaway type, minimum nine inches (9") long, fabricated of sheet aluminum, prepared with chromate treatment primer and painted with two coats of flat black enamel. The visor must fit tightly against the front 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 door to secure the visor.

LED OPTICAL UNITS

- 4. (a) The traffic signal heads must be provided with LED optical units capable of providing a selectively visible or veiled projected indication anywhere within 15 degrees of the signal optical axis.
- (b) Optical System. The optical system will consist of LED lamp for optically programmable signals, lamp collar, optical limiter-diffuser, objective lens and photo controls. The optical units and visor must be designed as a whole so as to eliminate the return of outside rays entering the unit from above the horizontal (known as sun phantom). The optical unit must be designed and assembled so that no light can escape from one indication to another.
- (c) Light Emitting Diode (Led) Optical Units
 - 1. Light emitting diode (LED) optical units must consist of an integral unit containing the following components: 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.
 - 2. The LED unit must be of such dimensions as to permit mounting in programmable traffic signal housing, be interchangeable with incandescent optical units.
 - 3. The LED unit must 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 must meet the green module requirements for brightness.

4. Minimum brightness of LED signal units must be in accordance with the luminous requirements in a standard testing procedure as defined by Section 4 of the VTCSH Part 2: LED Vehicle Signal Modules. During the required operating life of LED signal units, the luminance output of the units must not be less than 60 percent (60%) of the values specified in the standard.

5. Unit lenses must be twelve inches in diameter and be constructed of ultraviolet (UV) stabilized , impact resistant polycarbonate, acrylic or other approved material. Lenses must be clear or tinted.

6. Units must consist of LEDs uniformly distributed to present a homogeneous appearance on the face of the lens from a wide viewing angle.

7. LEDs must be wired so that the loss of a single LED or a string of LEDs will not reduce the luminescence below the minimum requirement.

8. 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 (20%) of LEDs are not operable.

9. Unit power supply must be constant current regulated and filtered to provide instant on indications, and to prevent momentary signal outages or flicker. Units must be fully operable over a range of 90 volts to 130 volts at 60 hertz, plus or minus 3 hertz.

10. Surge protection. Each unit must be provided with integral surge protection to withstand transient of 600 volt, 100 microsecond rise and 1 millisecond pulse width. The surge protector must provide full electrical and physical protection to all unit components.

11. Maximum permissible power consumption at ambient conditions (nominal 120 volts, 60 hertz, 70° F.) must be 30 watts at a minimum 90 percent power factor. Power consumed must not vary by more than ten percent (10%)from nominal power consumption over voltage range of 105 volts to 125 volts, and over permissible environmental ranges.

12. Units must be fully operable at temperature ranges of -40° F. (-40° C.) to +165° F. (+74° C.) at up to 100% relative humidity.

13. Units must be clearly marked on the back surface of the unit in a permanent manner showing information required for warranty and long term performance. Information to be shown must include manufacturer name, date of manufacture, electric power requirements, signal model type including color and indication type,

and signal serial number.

14. The LED unit must be compatible with the traffic signal controller equipment currently in use by the City of Chicago, and meeting the City's latest specifications for traffic signal control equipment. In particular the LED unit must be compatible with the NEMA TS-1 and later traffic signal load switches and conflict monitors.

15. 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.

16. Total harmonic distortion (THD) induced into the voltage and current AC power line sine waves must not exceed 20 percent.

17. LED optical units must meet the requirements of VTCSH Part 2: LED Vehicle Signal Modules Section 6.3.1 for signal burn-in

- (d) Lamp Collar. The lamp housing must consist of an integral lamp support, indexed ceramic socket, and quick release self-aligning lamp retainer. The electrical connection between the lamp housing and signal case must be accomplished with an interlock assembly which disconnects the lamp housing when opened.
- (e) Optical Limiter - Diffuser. The optical limiter-diffuser must provide an imaging surface at focus on the optical axis for objects 900 to 1,200 feet distance and permit an optical masking tape to be variously applied as determined by the desired visibility zone. The optical limiter-diffuser must be provided with positive indexing means and composed of heat-resistant glass.
- (f) Objective Lens. The objective lens must be a high resolution planar incremental lens hermetically sealed with a flat laminate of weather-resistant acrylic. The lens must be symmetrical in outline and capable of being rotated to any 90 degree orientation about the optical axis. The projected signal indication must be capable of being veiled anywhere within 15 degrees of the optical axis. The indication must not result from external illumination and must conform to the Institute of Transportation Engineers Standards.

WIRING

5. (a) Wire Leads. Each lamp connector must be furnished with three (3) leads color coded as follows:

White	Common
Red	Red Section 1
Yellow	Yellow Section 2
Green	Green Section 3
Yellow with Black Tracer	Yellow Arrow Section 4
Green with Black Tracer	Green Arrow Section 5

The lead must be type TEW No. 18 AWG stranded copper wire with 2/64 inch thick, 600 volt, 105 degrees C 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.

- (b) Terminal Strip. A dual-point, barrier type, terminal strip with a solid base and pressure plate type connectors (Marathon Special Products Corporation Catalog No. TB-300 Series -SP, or equal) must be securely attached at both ends to the housing body inside the "Green" section of the signal head. The number of terminal points must be predicated upon the number of sections in the signal head. Single section, 2 section, 3 section and 4 section heads must have 5 point blocks, while 5 section heads must have 6 point blocks.
- (c) Cable. One, eleven foot (11') length of flexible electric cord, medium duty, jacketed, must be furnished with each signal head. The number of conductors must include a type SO, No. 16 AWG stranded copper conductor, color coded, rubber insulated, neoprene 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.

TESTING AND DOCUMENTATION REQUIREMENTS

- 6. (a) Documentation. The contractor must provide certified manufacturing and testing documentation to demonstrate that the traffic signals being supplied meet or exceed the specification requirements.
- (b) Inspection. The signals will be subject to inspection at the discretion of the Commissioner. Final inspection must be made at point of delivery. Any signal rejected must be removed and disposed of by the contractor at his sole cost.
- (c) Warranty. The manufacturer must warrant the signals to meet the requirements of this specification, and must warrant all equipment, components, parts and appurtenances against defective design, material and workmanship for a period of three (3) years from date of acceptance. In addition, LED optical units must carry a seven (7) year warranty against failure or loss of color (chromicity) 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 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 must be evidenced by a letter or certificate of warranty submitted to the City at the time delivery is made. The LED warranty must cover all units delivered in an order or installed by contract, and must include unit serial numbers. The warranty must be signed and dated by an official of the manufacturer who is empowered by the manufacturer to enter into such a warranty.

PACKAGING

- 7. (a) Packing. Each traffic signal assembly must be packed in a suitable carton so secured that the signal will not be damaged during shipment, handling or storage.
- (b) Marking. Each carton containing a traffic signal must be clearly marked on the outside in letters not less than three-eighths (3/8) inch tall with the legend: "TRAFFIC SIGNAL, OPTICALLY PROGRAMMED@, the number of Sections as

required, the colors, the name of the manufacturer, the date of manufacture, the pertinent Contract Number and the appropriate City Commodity Code Number.

PEDESTRIAN COUNTDOWN TRAFFIC SIGNAL, LED, 16 INCH WITH SYMBOLIC WALK/DON'T WALK LENSES

1.0 GENERAL REQUIREMENTS

1.1 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.

1.2 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 Engineer of Electricity, Bureau of Electricity, 2451 South Ashland Avenue, Chicago, Illinois 60608.

1.3 Standards. Equipment furnished under this specification must meet the appropriate requirements of the following standards, as required within the body of this specification:

- American Association of State Highway and Transportation Officials (AASHTO)
- American Society for Testing and Materials (ASTM)
- Institute of Transportation Engineers (ITE)
- National Electrical Manufacturers Association (NEMA)
- Underwriters Laboratories (UL)

1.4 Approval. Approval will mean approval in writing by the Commissioner or his/her duly authorized representative.

2.0 MATERIAL AND EQUIPMENT REQUIREMENTS

2.1 The pedestrian signal heads must conform to ITE Standard "Pedestrian Traffic Control Signal Indications" (PTCSI), in which the most recently published revisions will govern.

2.2 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.

(a) 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	12-16 ft.	ASTM D 256

(notched, 1/8" thick) lbs./in.
Fatigue strength (at 2.5 mm cycles) 950 PSI min. ASTM D 671

- (b) 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 must 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.
- (d) 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.

2.3 LED Optical Unit

2.3.1 LED Optical Unit. The light emitting diode (LED) optical unit must consist of a lens, reflector and lamp holder. 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.

- (a) Light emitting diode (LED) optical units must consist of an integral unit containing the following components: power leads, housing, integral lens, matrix of light emitting diodes (LEDs) emitting monochromatic light of desired colors, and electronic and electrical components necessary to permit operation at nominal 120 volt, 60 hertz power.

- (b) The LED unit must 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 must consist of LEDs uniformly distributed to present a homogeneous appearance on the face of the lens from a wide viewing angle.
- (e) LEDs must be wired so that the loss of a single LED or a string of LEDs will not reduce the luminescence below the minimum requirement.
- (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 must 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 must be clearly marked on the back surface of the unit in a permanent manner showing information required for warranty and long term performance. Information to be shown must include manufacturer name, date of manufacture, electric power requirements, signal model type, and signal serial number.
- (l) The LED unit must 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 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.
- 2.3.2 Display. The message area must be approximately 16 inches square and display the double overlay "Don't Walk" and "Walk" symbols immediately adjacent to the countdown digits. The symbols must be applied in such a manner as to provide an opaque polycarbonate background and illuminated legends.
- (a) 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.
 - (b) Countdown Digits. Countdown digits must be Portland Orange and not less 9" high with proportional width and shall be compliant with latest ITE standards.
- 2.4 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.
- 2.5 Wiring. 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, 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.
- 2.6 Terminal Strip. A four terminal, eight point, barrier type terminal strip with solid base and pressure plate type connectors, such as Marathon Special Products Corporation Catalog Number TB-304-SP, must be securely attached at each end to the housing body inside the walk section.
- 2.7 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.
- 3.0 COUNTDOWN FUNCTIONALITY
- 3.1 The countdown module must 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.

- 3.2 The countdown timer must have a micro-processor capable of recording its own time when connected to a traffic controller.
- 3.3 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.
- 3.4 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).
- 3.5 At the end of the pedestrian change interval, the module must display A0" and the blank out. The display must remain dark until the beginning of the next countdown.
- 3.6 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.
- 3.7 The countdown must remain synchronized with signal indications and always reach A0" at the end of the pedestrian change interval.
- 3.8 The countdown must not display an erroneous or conflicting time when subjected to defective load switches.

4.0 TESTING AND DOCUMENTATION REQUIREMENTS

- 4.1 Documentation. The contractor must provide certified manufacturing and testing documentation to demonstrate that the pedestrian signals being supplied meet or exceed the specification requirements. Testing must be conducted by an independent and certified testing laboratory.
- 4.2 Inspection. The signals must be subject to inspection at the discretion of the Commissioner. Final inspection must be made at point of delivery. Any signal rejected must be removed and disposed of by the contractor at his sole cost.
- 4.3 Warranty. The manufacturer must warrant the signals to meet the requirements of this specification, and must warrant all equipment, components, parts and appurtenances against defective design, material and workmanship for a period of three (3) years from date of acceptance. In addition, LED optical units must carry an additional warranty against failure or loss of color (chromaticity) and signal brightness (luminance) below minimum acceptable VTCSH 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 occur in the LED unit during the warranty period, the manufacturer must repair or replace such defects and failures at no expense to the City. This warranty must be evidenced by a letter or certificate of warranty submitted to the City at the time final delivery is made. 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.

5.0 PACKING

5.1 Packing. Each pedestrian signal assembly must be packed in a suitable carton so secured that the signal will not be damaged during shipment, handling, or storage.

5.2 Marking. Each carton containing a pedestrian signal must be clearly marked on the outside in letters not less than three-eighths inch (3/8") tall with the legend: "PEDESTRIAN SIGNAL, COUNTDOWN, 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.

REMOVAL AND DISPOSAL OF REGULATED SUBSTANCES

This work shall be according to Section 669 of the Standard Specifications and the following:

Revise the second and third sentence of the first paragraph of Article 669.08 to read: "The affected area shall be monitored with a photo ionization detector (PID) utilizing a lamp of 10.6 eV or greater or an instrument with a flame ionization detector (FID). Any reading on the PID or FID in excess of background levels indicates the potential presence of contaminated material requiring it to be properly managed as either a non-special waste, non-hazardous special waste, or hazardous waste."

Revise the fourth and fifth sentence of the second paragraph of Article 669.08 to read: "When the analytical results indicate that detected levels are at or below the most stringent maximum allowable concentration (MAC) for chemical constituents in uncontaminated soil established pursuant to the proposed Subpart F of 35 Illinois Administrative Code (IAC) 1100.605, the soil excavated shall be included in the storm sewer or earth excavation, as appropriate, and backfill shall be in accordance to Article 205 and/or 208. When the analytical results indicate that detected levels are above the most stringent MAC for chemical constituents in uncontaminated soil established pursuant to the proposed Subpart F of 35 IAC 1100.605, the soil excavated shall be considered a waste and managed appropriately."

Qualifications. The term environmental firm shall mean an environmental firm with at least five (5) documented leaking underground storage tank (LUST) cleanups or that is pre-qualified in hazardous waste by the Department. Documentation includes but not limited to verifying remediation and special waste operations for sites contaminated with gasoline, diesel, or waste oil in accordance with all Federal, State, or local regulatory requirements and shall be provided to the Engineer for approval. The environmental firm selected shall not be a former or current consultant or have any ties with any of the properties contained within and/or adjacent to this construction project.

General. Special Provision will likely require the contractor to subcontract for the execution of certain activities.

All contaminated materials shall be managed as either "uncontaminated soil" or non-special waste. This work shall include monitoring and potential sampling, analytical testing, and management of a material contaminated by regulated substances. The Environmental Firm shall continuously monitor all soil excavation for worker protection and soil contamination. **Phase I Preliminary Engineering information is available through the District's Environmental Studies Unit.** Soil samples or analysis without the approval of the Engineer will be at no additional cost to the Department.

A). The Contractor shall manage and dispose of all soils excavated within the following areas as classified below. The lateral distance is measured from centerline and the farthest distance is the offset distance or construction limit whichever is less.

1. Station 49+89 to Station 50+05 25 to 45 feet LT (Commercial Building, Site 2549-2, 6536-6540 North Sheridan Road) – non-special waste. Contaminants of concern sampling parameters: PNAs.

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2. Station 50+50 to Sta 50+75 30 to 50 feet RT (Loyola University, Site 2549-1, 6515-6551 North Sheridan Road) – non-special waste. Contaminants of concern sampling parameters: PNAs.
3. Station 13+00 to Station 14+17 0 to 30 feet LT and RT (Parking Lot, Site 2549-3, 6542-6548 North Sheridan Road) – non-special waste. Contaminants of concern sampling parameters: Lead.

State of Illinois
Department of Transportation
Bureau of Local Roads and Streets

SPECIAL PROVISION
FOR
COOPERATION WITH UTILITIES

Effective: January 1, 1999
Revised: January 1, 2007

All references to Sections or Articles in this specification shall be construed to mean specific Section or Article of the Standard Specifications for Road and Bridge Construction, adopted by the Department of Transportation.

Replace Article 105.07 of the Standard Specifications with the following:

"105.07 Cooperation with Utilities. 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.

When the plans or special provisions include information pertaining to the location of underground utility facilities, such information represents only the opinion of the Department as to the location of such utilities and is only included for the convenience of the bidder. The Department assumes no responsibility in respect to the sufficiency or the accuracy of the information shown on the plans relative to the location of the underground utility facilities.

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 existing 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. When utility adjustments must be performed in conjunction with construction, the utility adjustment work will be shown on the plans and/or covered by Special Provisions.

When the Contractor discovers a utility has not been adjusted by the owner or the owner's representative as indicated in the contract documents, or the utility is not shown on the plans or described in the Special Provisions as to be adjusted in conjunction with construction, the Contractor shall not interfere with said utility, and 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.

All necessary adjustments, as determined by the Engineer, of utilities not shown on the plans or not identified by markers, will be made at no cost to the Contractor except traffic structures, light poles, etc., that are normally located within the proposed construction limits as hereinafter defined will not be adjusted unless required by the proposed improvement.

(a) Limits of Proposed Construction for Utilities Paralleling the Roadway. For the purpose of this Article, limits of proposed construction for utilities extending in the same longitudinal direction as the roadway, shall be defined as follows:

- (1) The horizontal limits shall be a vertical plane, outside of, parallel to, and 600 mm (2 ft) 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 1.2 m (4 ft) 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 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. For the purpose of this Article, limits of proposed construction for utilities crossing the roadway in a generally transverse direction shall be defined as follows:

- (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.

The Contractor may make arrangements for adjustment of utilities outside of the limits of proposed construction provided the Contractor furnishes the Department with a signed agreement with the utility owner covering the adjustments to be made. The cost of any adjustments made outside the limits of proposed construction shall be the responsibility of the Contractor unless otherwise provided.

The Contractor shall request all utility owners to field locate their facilities according to Article 107.31. The Engineer may make the request for location from the utility after receipt of notice from the Contractor. On request, the Engineer will make an inspection to verify that the utility company has field located its facilities, but will not assume responsibility for the accuracy of such work. The Contractor shall be responsible for maintaining the excavations or markers provided by the utility owners. This field location procedure may be waived if the utility owner has stated in writing to the Department it is satisfied the construction plans are sufficiently accurate. If the utility owner does not submit such statement to the Department, and they do not field locate their facilities in both horizontal and vertical alignment, 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 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 orally and in writing.

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.

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.

No additional compensation will be allowed for any delays, inconvenience, or damage sustained by the Contractor due to any interference from the said utility facilities or the operation of relocating the said utility facilities.

State of Illinois
Department of Transportation
Bureau of Local Roads and Streets

SPECIAL PROVISION
FOR
INSURANCE

Effective: February 1, 2007
Revised: August 1, 2007

All references to Sections or Articles in this specification shall be construed to mean specific Section or Article of the Standard Specifications for Road and Bridge Construction, adopted by the Department of Transportation.

The Contractor shall name the following entities as additional insured under the Contractor's general liability insurance policy in accordance with Article 107.27:

Loyola University

The entities listed above and their officers, employees, and agents shall be indemnified and held harmless in accordance with Article 107.26.

AGREEMENT TO PLAN QUANTITY (BDE)

Effective: January 1, 2012

Revise the second paragraph of Article 202.07(a) of the Standard Specifications to read:

“When the plans or work have been altered, or when disagreement exists between the Contractor and the Engineer as to the accuracy of the plan quantities, either party shall, before any work is started which would affect the measurement, have the right to request in writing and thereby cause the quantities involved to be measured. When plan quantities are revised by the issuance of revised plan sheets that are made part of the contract, and the Contractor and the Engineer have agreed in writing that the revised quantities are accurate, no further measurement will be required and payment will be made for the revised quantities shown.”

80275

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 ^{1/}	600-749	2002
	750 and up	2006
June 1, 2011 ^{2/}	100-299	2003
	300-599	2001
	600-749	2002
	750 and up	2006
June 1, 2012 ^{2/}	50-99	2004
	100-299	2003
	300-599	2001
	600-749	2002
	750 and up	2006

1/ Effective dates apply to Contractor diesel powered off-road equipment assigned to the contract.

2/ Effective dates apply to Contractor and subcontractor diesel powered off-road equipment assigned to the contract.

The retrofit emission control devices shall achieve a minimum PM emission reduction of 50 percent and shall be:

- a) Included on the U.S. Environmental Protection Agency (USEPA) *Verified Retrofit Technology List* (<http://www.epa.gov/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.

80261

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CONSTRUCTION AIR QUALITY - DIESEL VEHICLE EMISSIONS CONTROL (BDE)

Effective: April 1, 2009

Revised: January 2, 2012

Diesel Vehicle Emissions Control. The reduction of construction air emissions shall be accomplished by using cleaner burning diesel fuel. The term "equipment" refers to any and all diesel fuel powered devices rated at 50 hp and above, to be used on the project site in excess of seven calendar days over the course of the construction period on the project site (including any "rental" equipment).

All equipment on the jobsite, with engine ratings of 50 hp and above, shall be required to: use Ultra Low Sulfur Diesel fuel (ULSD) exclusively (15 ppm sulfur content or less).

Diesel powered equipment in non-compliance will not be allowed to be used on the project site, and is also subject to a notice of non-compliance as outlined below.

The Contractor shall certify that only ULSD will be used in all jobsite equipment. The certification shall be presented to the Department prior to the commencement of the work.

If any diesel powered equipment is found to be in non-compliance with any portion of this specification, the Engineer will issue the Contractor a notice of non-compliance and identify an appropriate period of time, as outlined below under environmental deficiency deduction, in which to bring the equipment into compliance or remove it from the project site.

Any costs associated with bringing any diesel powered equipment into compliance with these diesel vehicle emissions controls 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 also not be grounds for a claim.

Environmental Deficiency Deduction. When the Engineer is notified, or determines that an environmental control deficiency exists, he/she will notify the Contractor in writing, and direct the Contractor to correct the deficiency within a specified time period. The specified time-period, which begins upon Contractor notification, will be from 1/2 hour to 24 hours long, based on the urgency of the situation and the nature of the deficiency. The Engineer shall be the sole judge regarding the time period.

The deficiency will be based on lack of repair, maintenance and diesel vehicle emissions control.

If the Contractor fails to correct the deficiency within the specified time frame, 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.

If a Contractor or subcontractor accumulates three environmental deficiency deductions 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 contract time, waiver of penalties, or be grounds for any claim.

80237

CONSTRUCTION AIR QUALITY - IDLING RESTRICTIONS (BDE)

Effective: April 1, 2009

Idling Restrictions. The Contractor shall establish truck-staging areas for all diesel powered vehicles that are waiting to load or unload material at the jobsite. Staging areas shall be located where the diesel emissions from the equipment will have a minimum impact on adjacent sensitive receptors. The Department will review the selection of staging areas, whether within or outside the existing highway right-of-way, to avoid locations near sensitive areas or populations to the extent possible. Sensitive receptors include, but are not limited to, hospitals, schools, residences, motels, hotels, daycare facilities, elderly housing and convalescent facilities. Diesel powered engines shall also be located as far away as possible from fresh air intakes, air conditioners, and windows. The Engineer will approve staging areas before implementation.

Diesel powered vehicle operators may not cause or allow the motor vehicle, when it is not in motion, to idle for more than a total of 10 minutes within any 60 minute period, except under any of the following circumstances:

- 1) The motor vehicle has a gross vehicle weight rating of less than 8000 lb (3630 kg) .
- 2) The motor vehicle idles while forced to remain motionless because of on-highway traffic, an official traffic control device or signal, or at the direction of a law enforcement official.
- 3) The motor vehicle idles when operating defrosters, heaters, air conditioners, or other equipment solely to prevent a safety or health emergency.
- 4) A police, fire, ambulance, public safety, other emergency or law enforcement motor vehicle, or any motor vehicle used in an emergency capacity, idles while in an emergency or training mode and not for the convenience of the vehicle operator.
- 5) The primary propulsion engine idles for maintenance, servicing, repairing, or diagnostic purposes if idling is necessary for such activity.
- 6) A motor vehicle idles as part of a government inspection to verify that all equipment is in good working order, provided idling is required as part of the inspection.
- 7) When idling of the motor vehicle is required to operate auxiliary equipment to accomplish the intended use of the vehicle (such as loading, unloading, mixing, or processing cargo; controlling cargo temperature; construction operations, lumbering operations; oil or gas well servicing; or farming operations), provided that this exemption does not apply when the vehicle is idling solely for cabin comfort or to operate non-essential equipment such as air conditioning, heating, microwave ovens, or televisions.
- 8) When the motor vehicle idles due to mechanical difficulties over which the operator has no control.
- 9) The outdoor temperature is less than 32 °F (0 °C) or greater than 80 °F (26 °C).

When the outdoor temperature is greater than or equal to 32 °F (0 °C) or less than or equal to 80 °F (26 °C), a person who operates a motor vehicle operating on diesel fuel shall not cause or allow the motor vehicle to idle for a period greater than 30 minutes in any 60 minute period while waiting to weigh, load, or unload cargo or freight, unless the vehicle is in a line of vehicles that regularly and periodically moves forward.

The above requirements do not prohibit the operation of an auxiliary power unit or generator set as an alternative to idling the main engine of a motor vehicle operating on diesel fuel.

Environmental Deficiency Deduction. When the Engineer is notified, or determines that an environmental control deficiency exists based on non-compliance with the idling restrictions, he/she will notify the Contractor, and direct the Contractor to correct the deficiency.

If the Contractor fails to correct the deficiency a monetary deduction will be imposed. The monetary deduction will be \$1,000.00 for each deficiency identified.

80239

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 16.00% 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.

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 is 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 it receives as a result of the lease arrangement.
- (e) DBE as a material supplier:
 - (1) 60 percent goal credit for the cost of the materials or supplies purchased from a DBE regular dealer.
 - (2) 100 percent goal credit for the cost of materials or supplies obtained from a DBE manufacturer.
 - (3) 100 percent credit for the value of reasonable fees and commissions for the procurement of materials and supplies if not a 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 DBE companies indicated in the Utilization Plan and after good faith efforts are reviewed, the Department may deduct from contract payments to the Contractor the amount of the goal not achieved as liquidated and ascertained damages. The Contractor may request an administrative

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| 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.

80029

ERRATA FOR THE 2012 STANDARD SPECIFICATIONS (BDE)

Effective: April 1, 2012

Revised: August 1, 2012

- Page 182 Article 354.12. In the second line of the first paragraph change "Article 353.12" to "Article 353.13".
- Page 183 Article 355.10. In the second line of the first paragraph change "Article 353.12" to "Article 353.13".
- Page 185 Article 356.10. In the second line of the first paragraph change "Article 353.12" to "Article 353.13".
- Page 337 Article 505.04. Revise the subparagraph "(i) Match Making." to "(i) Match Marking."
- Page 360 Article 506.07. In the first line of the second paragraph change "AASHTO/AWS D1.5/D1.5:" to "AASHTO/AWS D1.5M/D1.5:".
- Page 361 Article 506.08. In the third line of the sixth paragraph change "506.08(a)" to "506.08(b)".
- Page 531 Article 609.07. In the first paragraph delete "TYPE B, C, or D INLET BOX STANDARD 609001 or".
- Page 601 Article 701.18(h). In the first line of the first paragraph change "Standard 701426." "Standard 701426 and 701427."
- Page 609 Article 703.05. In the first line of the second paragraph delete "or Type II".
- Page 989 Article 1083.02(a). In the seventh line of the first paragraph change "Table 14.7.5.2-2" to "Table 14.7.5.2-1".
- Page 1019 Article 1095.01(b)(1)e. In the table for daylight reflectance for the color yellow, change "75 % min." to "45 % min."

80296

FRICTION AGGREGATE (BDE)

Effective: January 1, 2011

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.

(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	Stabilized Subbase or Shoulders	<u>Allowed Alone or in Combination:</u> Gravel Crushed Gravel Carbonate Crushed Stone Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag ^{1/} Crushed Concrete

Use	Mixture	Aggregates Allowed
HMA High ESAL Low ESAL	Binder IL-25.0, IL-19.0, or IL-19.0L SMA Binder	<u>Allowed Alone or in Combination:</u> Crushed Gravel Carbonate Crushed Stone ^{2/} Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Concrete ^{3/}
HMA High ESAL Low ESAL	C Surface and Leveling Binder IL-12.5, IL-9.5, or IL-9.5L SMA Ndesign 50 Surface	<u>Allowed Alone or in Combination:</u> Crushed Gravel Carbonate Crushed Stone ^{2/} Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag ^{4/} Crushed Concrete ^{3/}
HMA High ESAL	D Surface and Leveling Binder IL-12.5 or IL-9.5 SMA Ndesign 50 Surface	<u>Allowed Alone or in Combination:</u> Crushed Gravel Carbonate Crushed Stone (other than Limestone) ^{2/} Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) ^{5/} Crushed Steel Slag ^{4/ 5/} Crushed Concrete ^{3/}
		<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) ^{5/} or Crushed Sandstone

Use	Mixture	Aggregates Allowed	
HMA High ESAL	E Surface IL-12.5 or IL-9.5 SMA Ndesign 80 Surface	<u>Allowed Alone or in Combination:</u> Crushed Gravel Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) ^{5/} Crushed Steel Slag ^{5/} Crushed Concrete ^{3/} No Limestone.	
		<u>Other Combinations Allowed:</u>	
		<i>Up to...</i>	<i>With...</i>
		50% Dolomite ^{2/}	Any Mixture E aggregate
		75% Dolomite ^{2/}	Crushed Sandstone, Crushed Slag (ACBF) ^{5/} , Crushed Steel Slag ^{5/} , or Crystalline Crushed Stone
75% Crushed Gravel or Crushed Concrete ^{3/}	Crushed Sandstone, Crystalline Crushed Stone, Crushed Slag (ACBF) ^{5/} , or Crushed Steel Slag ^{5/}		
HMA High ESAL	F Surface IL-12.5 or IL-9.5 SMA Ndesign 80 Surface	<u>Allowed Alone or in Combination:</u> Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) ^{5/} Crushed Steel Slag ^{5/} No Limestone.	
		<u>Other Combinations Allowed:</u>	
		<i>Up to...</i>	<i>With...</i>

Use	Mixture	Aggregates Allowed	
		50% Crushed Gravel, Crushed Concrete ^{3/} , or Dolomite ^{2/}	Crushed Sandstone, Crushed Slag (ACBF) ^{5/} , Crushed Steel Slag ^{5/} , or Crystalline Crushed Stone

- 1/ Crushed steel slag allowed in shoulder surface only.
- 2/ Carbonate crushed stone shall not be used in SMA Ndesign 80. In SMA Ndesign 50, carbonate crushed stone shall not be blended with any of the other aggregates allowed alone in Ndesign 50 SMA binder or Ndesign 50 SMA surface.
- 3/ Crushed concrete will not be permitted in SMA mixes.
- 4/ Crushed steel slag shall not be used as leveling binder.
- 5/ When either slag is used, the blend percentages listed shall be by volume."

80265

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	N _{design} = 50	93.0 – 97.4%	91.0%
IL-9.5, IL-12.5	N _{design} ≥ 90	92.0 – 96.0%	90.0%
IL-9.5, IL-9.5L, IL-12.5	N _{design} < 90	92.5 – 97.4%	90.0%
IL-19.0, IL-25.0	N _{design} ≥ 90	93.0 – 96.0%	90.0%
IL-19.0, IL-19.0L, IL-25.0	N _{design} < 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%"

80246

METAL HARDWARE CAST INTO CONCRETE (BDE)

Effective: April 1, 2008
Revised: January 1, 2012

Add the following to Article 503.02 of the Standard Specifications:

“(h) Metal Hardware Cast into Concrete1006.13”

Add the following to Article 504.02 of the Standard Specifications:

“(j) Metal Hardware Cast into Concrete1006.13”

Revise Article 1006.13 of the Standard Specifications to read:

“1006.13 Metal Hardware Cast into Concrete. Unless otherwise noted, all steel hardware cast into concrete, such as inserts, brackets, cable clamps, metal casings for formed holes, and other miscellaneous items, shall be galvanized according to AASHTO M 232 or AASHTO M 111. Aluminum inserts will not be allowed. Zinc alloy inserts shall be according to ASTM B 86, Alloys 3, 5, or 7.

When stainless steel junction boxes or other stainless steel appurtenances are specified, Type 304 stainless steel hardware shall be used when cast into concrete.

The inserts shall be UNC threaded type anchorages having the following minimum certified proof load.

Insert Diameter	Proof Load
5/8 in. (16 mm)	6600 lb (29.4 kN)
3/4 in. (19 mm)	6600 lb (29.4 kN)
1 in. (25 mm)	9240 lb (41.1 kN)”

80203

PAVEMENT PATCHING (BDE)

Effective: January 1, 2010

Revise the first sentence of the second paragraph of Article 701.17(e)(1) of the Standard Specifications to read:

“In addition to the traffic control and protection shown elsewhere in the contract for pavement, two devices shall be placed immediately in front of each open patch, open hole, and broken pavement where temporary concrete barriers are not used to separate traffic from the work area.”

80254

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.

80022

PLANTING WOODY PLANTS (BDE)

Effective: January 1, 2012

Revised: August 1, 2012

Revise the second sentence of Article 253.01 of the Standard Specifications to read:

“This work shall consist of furnishing, transporting, and planting woody plants such as trees, shrubs, evergreens, vines, and seedlings.”

Revise Article 253.02(a) of the Standard Specifications to read:

“(a) Trees, Shrubs, Evergreens, Vines and Seedlings 1081.01”

Revise the first sentence of Article 253.08(a) of the Standard Specifications to read:

“(a) Excavation for Deciduous Trees and Evergreen Trees.”

Revise the first sentence of Article 253.08(b) of the Standard Specifications to read:

“(b) Excavation for Deciduous Shrubs, Evergreen Shrubs, Vines, and Seedlings.”

Revise the first sentence of Article 253.13 of the Standard Specifications to read:

“All deciduous and evergreen trees, with the exception of multi-stem or clump form specimens, over 8 ft (2.5 m) in height shall require three 6 ft (2 m) long steel posts so placed that they are equidistant from each other and adjacent to the outside of the ball.”

Revise the first sentence of the second paragraph of Article 253.14 of the Standard Specifications to read:

“This period of establishment for the plants shall not delay acceptance of the entire project and final payment due if the contractor requires and receives from the subcontractor a third party performance bond naming the Department as obligee in the full amount of the planting quantities subject to this period of establishment, multiplied by their contract unit prices.”

Revise the third sentence of Article 253.16 of the Standard Specifications to read:

“Trees, shrubs, evergreens, and vines will be measured as each individual plant.”

Revise Article 253.17 of the Standard Specifications to read:

“**253.17 Basis of Payment.** This work will be paid for at the contract unit price per each for TREES, SHRUBS, EVERGREENS, or VINES, of the species, root type, and plant size specified; and per unit for SEEDLINGS. Payment will be made according to the following schedule.

- (a) Initial Payment. Upon completion of planting, mulch covering, wrapping, and bracing, 90 percent of the pay item(s) will be paid.
- (b) Final Payment. Upon inspection and acceptance of the plant material, or upon execution of a third party bond, the remaining ten percent of the pay item(s) will be paid."

Revise the first paragraph of Article 1081.01 of the Standard Specifications to read:

"1081.01 Trees, Shrubs, Evergreens, Vines, and Seedlings. Trees, shrubs, evergreens, vines, and seedlings shall be according to the current standards adopted by the ANLA."

80278

PORTLAND CEMENT CONCRETE (BDE)

Effective: January 1, 2012

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). 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 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 ^{1/}	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 ^{2/}	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 ^{2/}	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 ^{1/}	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 ^{2/}	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 ^{2/}	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) 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 (Na₂O + 0.658K₂O) 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
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(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 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). 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.

TABLE 1. CLASSES OF CONCRETE AND MIX DESIGN CRITERIA

Class of Conc.	Use	Specification Section Reference	Cement Factor cwt/cu yd (3)		Water / Cement Ratio lb/lb	Sump in. (4)	Mix Design Compressive Strength (Flexural Strength) psi, minimum			Air Content %	Coarse Aggregate Gradations (14)
			Min.	Max			Days	psi	Days		
PV	Pavement Base Course Base Course Widening Driveway Pavement Shoulders Shoulder Curb	420 or 421 353 354 423 483 662	5.65 (1) 6.05 (2)	7.05	0.32 - 0.42	2 - 4 (5)	Ty III	3500	CA 5 & CA 7, CA 5 & CA 11, CA 7, CA 11, or CA 14		
							(650)	(650)			
							3200 (600)				
							Article 701.17(e)(3)b.				
							at 48 hours				
PP	Pavement Patching Bridge Deck Patching (10) PP-1 PP-2 PP-3 PP-4 PP-5	442	6.50 6.20 (Ty III) 7.35 7.35 (Ty III) (8) 6.00 (9) 6.75 (9)	7.50 7.20 (Ty III) 7.35 7.35 (Ty III) (8) 6.25 (9) 6.75 (9)	0.32 - 0.44	2 - 4	at 48 hours	CA 7, CA 11, CA 13, CA 14, or CA 16			
							at 24 hours				
							at 16 hours				
							at 8 hours				
							at 4 hours				
RR	Railroad Crossing	422	6.50 6.20 (Ty III)	7.50 7.20 (Ty III)	0.32 - 0.44	2 - 4	3500 (650)	CA 7, CA 11, or CA 14			
							at 48 hours				
BS	Bridge Superstructure Bridge Approach Slab	503	6.05	7.05	0.32 - 0.44	2 - 4 (5)	4000	CA 7, CA 11, or CA 14 (7)			
							(675)				
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	CA 7, CA 11, CA 13, CA 14, CA 16, or CA 7 & CA 16			
							Plans				
PS	Precast Prestressed Members Precast Prestressed Piles and Extensions	504 512	5.65 5.65 (Ty III)	7.05 7.05 (Ty III)	0.32 - 0.44	1 - 4	5000	CA 11 (11), CA 13, CA 14 (11), or CA 16			
							3500				
	Precast Prestressed Sight Screen	639									

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TABLE 1. CLASSES OF CONCRETE AND MIX DESIGN CRITERIA

Class of Conc.	Use	Specification Section Reference	Cement Factor cw/cu yd (3)		Water / Cement Ratio lb/lb	Sump in. (4)	Mix Design Compressive Strength (Flexural Strength) psi, minimum			Air Content %	Coarse Aggregate Gradations (14)
			Min.	Max			3	14	28		
DS	Drilled Shaft (12)	516	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.	
	Metal Sheet Piles (12)	512									
	Sign Structures	734									
	Drilled Shaft (12)										
	Light Tower Foundation (12)	837									
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 7 & CA 11, CA 7, or CA 11	
SI	Structures (except Superstructure)	503	5.65 (1) 6.05 (2)	7.05	0.32 - 0.44	2 - 4 (5)	3500 (650)		5.0 - 8.0	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)	
	Sidewalk	424									
	Slope Wall	511									
	Encasement	512									
	Box Culverts	540									
	End Section and Collar	542									
	Curb, Gutter, Curb & Gutter, Median, and Paved Ditch	606									
	Concrete Barrier	637									
	Sign Structures	734									
	Spread Footing										
	Concrete Foundation										
	Pole Foundation (12)	836									
	Traffic Signal Foundation	878									
Drilled Shaft (12)											
Square or Rectangular											

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Notes:

- (1) Central-mixed.
- (2) Truck-mixed or shrink-mixed. Shrink-mixed concrete will not be permitted for Class PV concrete.
- (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 1 1/2 in.
- (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 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 gradations sizes may be used with the approval of the Engineer. Refer also to Article 1004.02(d) for additional information on combining sizes.

TABLE 1. CLASSES OF CONCRETE AND MIX DESIGN CRITERIA (metric)

Class of Conc.	Use	Specification Section Reference	Cement Factor kg/cu m (3)		Water / Cement Ratio kg/kg	Sump mm (4)	Mix Design Compressive Strength (Flexural Strength) kPa, minimum			Air Content %	Coarse Aggregate Gradations (14)
			Min.	Max.			3	14	28		
PV	Pavement Base Course Base Course Widening Driveway Pavement Shoulders Shoulder Curb	420 or 421 353 354 423 483 662	335 (1) 360 (2)	418	0.32 - 0.42	50 - 100 (5)	Ty III	24,000	5.0 - 8.0	CA 5 & CA 7, CA 5 & CA 11, CA 7, CA 11, or CA 14	
							24,000	(4500)			
							(4500)				
PP	Pavement Patching Bridge Deck Patching (10) PP-1 PP-2 PP-3 PP-4 PP-5	442	385 (Ty III) 365 (Ty III) 435 (Ty III) (8) 355 (9) 400 (9)	445 (Ty III) 425 (Ty III) (8) 370 (9) 400 (9)	0.32 - 0.44 0.32 - 0.38 0.32 - 0.35 0.32 - 0.50 0.32 - 0.40	50 - 100 50 - 150 50 - 100 50 - 150 50 - 200	22,100 (4150)	Article 701.17(e)(3)b.	4.0 - 7.0 4.0 - 6.0 4.0 - 6.0 4.0 - 6.0	CA 7, CA 11, CA 13, CA 14, or CA 16	
							at 48 hours				
							at 24 hours				
							at 16 hours				
							at 8 hours				
RR	Railroad Crossing	422	385 (Ty III)	445 (Ty III)	0.32 - 0.44	50 - 100	24,000 (4500)	4.0 - 7.0	CA 7, CA 11, or CA 14		
			365 (Ty III)	425 (Ty III)	0.32 - 0.44	50 - 100 (5)	at 48 hours	27,500 (4650)	5.0 - 8.0	CA 7, CA 11, or CA 14 (7)	
BS	Bridge Superstructure Bridge Approach Slab	503	360	418	0.32 - 0.44	50 - 100 (5)	See Section 1042	5.0 - 8.0 N/A	CA 7, CA 11, CA 13, CA 14, CA 16, or CA 7 & CA 16		
			335 (Ty III)	418 (Ty III)	0.32 - 0.44 0.25 - 0.40	25 - 100 0 - 25	Plans 34,500	24,000	5.0 - 8.0 or CA 16		
PC	Various Precast Concrete Items Wet Cast Dry Cast	1042	335 (Ty III)	418 (Ty III)	0.32 - 0.44 0.25 - 0.40	25 - 100 0 - 25	See Section 1042	5.0 - 8.0 N/A	CA 7, CA 11, CA 13, CA 14, CA 16, or CA 7 & CA 16		
			335 (Ty III)	418 (Ty III)	0.32 - 0.44	25 - 100	Plans 34,500	24,000	5.0 - 8.0 or CA 16		
PS	Precast Prestressed Members Precast Prestressed Piles and Extensions	504 512	335 (Ty III)	418 (Ty III)	0.32 - 0.44	25 - 100	See Section 1042	5.0 - 8.0 N/A	CA 7, CA 11, CA 13, CA 14, CA 16, or CA 7 & CA 16		
			335 (Ty III)	418 (Ty III)	0.32 - 0.44	25 - 100	Plans 34,500	24,000	5.0 - 8.0 or CA 16		
	Precast Prestressed Sight Screen	639									

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TABLE 1. CLASSES OF CONCRETE AND MIX DESIGN CRITERIA (metric)

Class of Conc.	Use	Specification Section Reference	Cement Factor kg/cu m (3)		Water / Cement Ratio kg/kg	Sump mm (4)	Mix Design Compressive Strength (Flexural Strength) kPa, minimum Days			Air Content %	Coarse Aggregate Gradations (14)
			Min.	Max			3	14	28		
DS	Drilled Shaft (12)	516	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.	
	Metal Shell Piles (12)	512									
	Sign Structures	734									
	Drilled Shaft (12)	837									
	Light Tower Foundation (12)										
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 7 & CA 11, CA 7, or CA 11	
SI	Structures (except Superstructure)	503									
	Sidewalk	424									
	Slope Wall	511									
	Encasement	512									
	Box Culverts	540									
	End Section and Collar	542									
	Curb, Gutter, Curb & Gutter, Median, and Paved Ditch	606									
	Concrete Barrier	637									
	Sign Structures	734									
	Spread Footing										
	Concrete Foundation										
	Pole Foundation (12)	836									
	Traffic Signal Foundation	878									
Drilled Shaft (12)											
Square or Rectangular											

- Notes:
- (1) Central-mixed.
 - (2) Truck-mixed or shrink-mixed. Shrink-mixed concrete will not be permitted for Class PV concrete.
 - (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 40 mm.
 - (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 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.

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 Contractors 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 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 concrete mixtures, for 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 (only truck-mixed permitted), 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 735 lbs/cu yd (435 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), 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.

Group I – Mixture options are not applicable. Use any cement or finely divided mineral.

Group II – Mixture options 1, 2, 3, 4, or 5 shall be used.

Group III – Mixture options 1, combine 2 with 3, 4 or 5 shall be used.

Group IV – Mixture options 1, combine 2 with 4, or 5 shall be used.

- 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 for 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.

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 ≤ 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, additional cement or 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 an 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, with the Engineer's approval, may add to the truck mixer non air-entraining cement in the proportion necessary to bring the air content within the specified limits, or the concrete may be 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 water storage tank for curing.

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 slag or lightweight aggregate shall be according to Article 1004.01(e).

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. Additional mixing beyond 100 revolutions shall be at agitating speed unless additions of water, admixtures, cement, 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. Additional mixing beyond 100 revolutions shall be at agitating speed, unless additions of water, admixtures, cement, 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

300

>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, admixtures, and cement 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 or truck-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
Cast-in-Place Concrete ^{11/}			
Pavement			
Shoulder	1020.13(a)(1)(2)(3)(4)(5) ^{3/5/}	3	1020.13(c)
Base Course			
Base Course Widening	1020.13(a)(1)(2)(3)(4)(5) ^{2/}	3	1020.13(c)
Driveway			
Median			
Barrier			
Curb			
Gutter	1020.13(a)(1)(2)(3)(4)(5) ^{4/5/}	3	1020.13(c) ^{16/}
Curb & Gutter			
Sidewalk			
Slope Wall			
Paved Ditch			
Catch Basin			
Manhole	1020.13(a)(1)(2)(3)(4)(5) ^{4/}	3	1020.13(c)
Inlet			
Valve Vault			
Pavement Patching	1020.13(a)(1)(2)(3)(4)(5) ^{2/}	3 ^{12/}	1020.13(c)
Bridge Deck Patching	1020.13(a)(3)(5)	3 or 7 ^{12/}	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) ^{4/6/}	7	1020.13(d)(1)(2)(3)
Substructure	1020.13(a)(1)(2)(3)(4)(5) ^{1/7/}	7	1020.13(d)(1)(2)(3)
Superstructure (except deck)	1020.13(a)(1)(2)(3)(5) ^{8/}	7	1020.13(d)(1)(2)
Deck			
Bridge Approach Slab	1020.13(a)(5)	7	1020.13(d)(1)(2) ^{17/}
Retaining Walls	1020.13(a)(1)(2)(3)(4)(5) ^{1/7/}	7	1020.13(d)(1)(2)
Pump Houses	1020.13(a)(1)(2)(3)(4)(5) ^{1/}	7	1020.13(d)(1)(2)
Culverts	1020.13(a)(1)(2)(3)(4)(5) ^{4/6/}	7	1020.13(d)(1)(2) ^{18/}
Other Incidental Concrete	1020.13(a)(1)(2)(3)(5)	3	1020.13(c)
Precast Concrete ^{11/}			
Bridge Slabs			
Piles and Pile Caps	1020.13(a)(3)(5) ^{9/10/}	As ^{13/}	9/
Other Structural Members		Required	
All Other Precast Items	1020.13(a)(3)(4)(5) ^{2/9/10/}	As ^{14/}	9/
		Required	
Precast, Prestressed Concrete ^{11/}			
All Items	1020(a)(3)(5) ^{9/10/}	Until Strand Tensioning is Released ^{15/}	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.
- 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 the concrete has been finished and the water sheen has disappeared from the surface, the concrete shall be immediately sealed with membrane curing compound of the type specified. The seal shall be maintained for the specified curing period. The edges of the concrete shall, likewise, be sealed immediately 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 as placed in the forms 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 as placed in the forms shall be a minimum of 50 °F (10 °C) and a maximum of 90 °F (32 °C).

When insulated forms are used, 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 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 shall be uniformly graded and preference for larger size aggregate shall be used in the mix design. Article 1004.02(d)(2) and information in the "Portland Cement Concrete Level III Technician Course – Manual of Instructions for Design of Concrete Mixtures" shall 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 if the time frame will be more than seven days.

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.

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 (10 °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 (10 °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. A copy of the ACI document shall be provided to the Engineer at the construction site. 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. A copy of the ACI document shall be provided to the Engineer at the construction site.

- (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 ± 2 °F (± 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 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.

80279

PORTLAND CEMENT CONCRETE SIDEWALK (BDE)

Effective: January 1, 2012

Revise Article 424.07 of the Standard Specifications to read:

"424.07 Expansion Joints. Expansion joints shall be 1/2 in. (13 mm) thick and consist of preformed joint filler. The top of the joint filler shall be 1/4 in. (6 mm) below the surface of the sidewalk.

Expansion joints shall be placed in locations as follows.

- (a) Expansion joints shall be placed between the sidewalk and all structures such as light poles, traffic signal poles, traffic poles and subway columns, which extend through the sidewalk.
- (b) Transverse expansion joints shall be placed at maximum intervals of 50 ft (15 m) in the sidewalk. Where the sidewalk is constructed adjacent to pavement or curb having expansion joints, the expansion joints in the sidewalk shall be placed in line with the adjacent expansion joints as nearly as practicable.
- (c) Expansion joints shall also be placed where the sidewalk abuts existing sidewalks, between driveway pavement and sidewalk, and between sidewalk accessibility ramps and curbs where the ramp abuts a curb."

80280

QUALITY CONTROL/QUALITY ASSURANCE OF CONCRETE MIXTURES (BDE)

Effective: January 1, 2012

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.

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 beam strength specimens may be cured in the same tank.

(2) Comparing Test Results. Differences between the Engineer's and the Contractor's split sample test results will not be considered extreme 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)
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, 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, or aggregate gradation split sample retest result is a failure; or if either the Engineer's or Contractor's strength 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, and jobsite air content; 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 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, and jobsite air content; 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 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/final revolution counter reading, at the jobsite, if the mixture is truck-mixed; time discharged at the jobsite; total amount of each admixture added at the jobsite; total amount of water added at the jobsite; and total amount of cement added at the jobsite if the air content needed adjustment.

(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 ^{1/}
Aggregates (Arriving at Plant)	Gradation ^{2/}	As needed to check source for each gradation number	T 2, T 11, T 27, and T 248
Aggregates (Stored at Plant in Stockpiles or Bins)	Gradation ^{2/}	2,500 cu yd (1,900 cu m) for each gradation number ^{3/}	T 2, T 11, T 27, and T 248
Aggregates (Stored at Plant in Stockpiles or Bins)	Moisture ^{4/} : Fine Aggregate	Once per week for moisture sensor, otherwise daily for each gradation number	Flask, Dunagan, Pycnometer Jar, or T 255
	Moisture ^{4/} : Coarse Aggregate	As needed to control production for each gradation number	Dunagan, Pycnometer Jar, or T 255
Mixture ^{5/}	Slump, Air Content, Unit Weight / Yield, and Temperature	As needed to control production	T 141 and T 119 T 141 and T 152 or T 196 T 141 and T 121 T 141 and T 309

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, using the Dunagan or Illinois Modified AASHTO T 255 test method. 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; or other tests at the plant to control mixture production.

SCHEDULE B

CONTRACTOR JOBSITE SAMPLING & TESTING ^{1/}			
Item	Measured Property	Random Sample Testing Frequency per Mix Design and per Plant ^{2/}	IL Modified AASHTO Test Method
Pavement, Shoulder, Base Course, Base Course Widening, Driveway Pavement, Railroad Crossing, Cement Aggregate Mixture II	Slump ^{3/ 4/}	1 per 500 cu yd (400 cu m) or minimum 1/day	T 141 and T 119
	Air Content ^{3/ 5/ 6/}	1 per 100 cu yd (80 cu m) or minimum 1/day	T 141 And T 152 or T 196
	Compressive Strength ^{7/ 8/} or Flexural Strength ^{7/ 8/}	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 ^{9/} , Bridge Deck ^{9/} , Bridge Deck Overlay ^{9/} , Superstructure ^{9/} , Substructure, Culvert, Miscellaneous Drainage Structures, Retaining Wall, Building Wall, Drilled Shaft Pile & Encasement Footing, Foundation, Pavement Patching, Structural Repairs	Slump ^{3/ 4/}	1 per 50 cu yd (40 cu m) or minimum 1/day	T 141 and T 119
	Air Content ^{3/ 5/ 6/}	1 per 50 cu yd (40 cu m) or minimum 1/day	T 141 And T 152 or T 196
	Compressive Strength ^{7/ 8/} or Flexural Strength ^{7/ 8/}	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 ^{3/}	1 per 250 cu yd (200 cu m) or minimum 1/day	T 141 and T 119
	Air Content ^{3/ 6/}	As needed to control production	T 141 And T 152 or T 196
	Compressive Strength ^{7/ 8/} or Flexural Strength ^{7/ 8/}	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 ^{1/}			
Curb, Gutter, Median, Barrier, Sidewalk, Slope Wall, Paved Ditch, Fabric Formed Concrete Revetment Mat ^{10/} , Miscellaneous Items, Incidental Items	Slump ^{3/ 4/}	1 per 100 cu yd (80 cu m) or minimum 1/day	T 141 and T 119
	Air Content ^{3/ 5/ 6/}	1 per 50 cu yd (40 cu m) or minimum 1/day	T 141 And T 152 or T 196
	Compressive Strength ^{7/ 8/} or Flexural Strength ^{7/ 8/}	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
All	Temperature ^{3/}	As needed to control production	T 141 and T 309
Controlled Low-Strength Material (CLSM)	Flow, Air Content and Compressive Strength	As needed to control production	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.

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. 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. 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 or more, 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.

If the Contractor's or Engineer's air content or slump test result is not within the specification limits, all subsequent truck loads delivered shall be tested by the Contractor until the problem is corrected.

- 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 at least two cylinder or two beam breaks for field tests.
- 8/ In addition to the strength test, an air test, slump test, and temperature test shall be performed on the same sample. 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.

SCHEDULE C

ENGINEER QUALITY ASSURANCE INDEPENDENT SAMPLE TESTING		
Location	Measured Property	Testing Frequency ^{1/}
Plant	Gradation of aggregates stored in stockpiles or bins, Slump and Air Content	As determined by the Engineer.
Jobsite	Slump, Air Content and Strength	As determined by the Engineer.

ENGINEER QUALITY ASSURANCE SPLIT SAMPLE TESTING		
Location	Measured Property	Testing Frequency ^{1/}
Plant	Gradation of aggregates stored in stockpiles or bins ^{2/}	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 ^{2/} and Air Content ^{2/3/}	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.
	Strength ^{2/}	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.

- 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."

80281

SELF-CONSOLIDATING CONCRETE FOR PRECAST AND PRECAST PRESTRESSED PRODUCTS (BDE)

Effective: July 1, 2004

Revised: April 1, 2012

Description. This work shall consist of constructing precast and precast prestressed concrete products with self-consolidating concrete. The concrete shall be according to the special provision, "Portland Cement Concrete", except as modified herein.

Definition. Self-consolidating concrete is a flowable mixture that does not require mechanical vibration for consolidation.

Mix Design Criteria. Article 1020.04 shall apply, except as follows:

- (a) If the maximum cement factor is not specified for the product, it shall not exceed 7.05 cwt/cu yd (418 kg/cu m).
- (b) If the maximum allowable water/cement ratio is not specified for the product, it shall not exceed 0.44.
- (c) The slump requirements shall not apply.
- (d) The concrete mixture shall be uniformly graded, and information in the "Portland Cement Concrete Level III Technician Course – Manual of Instructions for Design of Concrete Mixtures" shall 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 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.
- (e) The slump flow range shall be 22 in. (560 mm) minimum to 28 in. (710 mm) maximum.
- (f) The visual stability index shall be a maximum of 1.
- (g) The J-ring value shall be a maximum of 2 in. (50 mm).
- (h) The L-box blocking ratio shall be a minimum of 80 percent.
- (i) The hardened visual stability index shall be a maximum of 1.

Test Methods. Illinois Test Procedures SCC-1, SCC-2, SCC-3, SCC-4, SCC-6, SCC-8, (Option C) and Illinois Modified AASHTO T 22, 23, 121, 141, 152, 196, and 309 shall be used for testing of self-consolidating mixtures.

Mixing Portland Cement Concrete. In addition to Article 1020.11, the mixing time for central-mixed concrete shall not be reduced as a result of a mixer performance test. Truck-mixed concrete shall be mixed in a truck mixer for a minimum of 100 revolutions.

The batch sequence, mixing speed, and mixing time shall be appropriate to prevent cement balls and mix foaming for central-mixed and truck-mixed concrete.

Concrete Placement for Precast Products. The maximum distance of horizontal flow from the point of deposit shall not exceed 25 ft (7.6 m) for precast products. However, when the maximum distance of horizontal flow from the point of discharge exceeds 15 ft (4.6 m), the dynamic segregation index shall be a maximum 10.0 percent. If the maximum is exceeded, the maximum distance of horizontal flow from the point of deposit will not be allowed to exceed 15 ft (4.6 m).

Concrete Placement for Precast Prestressed Products. The maximum distance of horizontal flow from the point of deposit shall not exceed 15 ft (4.6 m) for precast prestressed products. In addition, the placement operation shall be moved as required to ensure the leading edge of the flowing concrete does not exceed 15 ft (4.6 m). For a bed of beams, a single beam shall be completely filled with concrete before placement of concrete in the next beam. For deck beams with void tubes installed in place prior to the pour, the concrete shall be placed on one side of the void tube until the concrete flows completely under the void tube to the other side. Once this has been completed, the concrete placement operation may be moved to the other side.

Consolidation. 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 will be permitted if it can be used in a manner that does not cause coarse aggregate separation from the mortar as determined by the Engineer. Any other method for restoring the fluidity of the concrete shall be approved by the Engineer.

80132

SIDEWALK, CORNER OR CROSSWALK CLOSURE (BDE)

Effective: January 1, 2012

Add the following to Article 701.03 of the Standard Specifications:

“(p) Detectable Pedestrian Channelizing Barricades1106.02(k)”

Add the following to Article 701.15 of the Standard Specifications:

“(n) Detectable Pedestrian Channelizing Barricade. Detectable pedestrian channelizing barricades are cane detectable and visible to persons having low vision. These barricades are used to channelize pedestrian traffic.”

Add the following to Article 1106.02 of the Standard Specifications:

“(m) Detectable Pedestrian Channelizing Barricades. The top and bottom panels shall have alternating white and orange stripes sloping at 45 degrees on the side exposed to pedestrian traffic. Barricade stripes shall be 6 in. (150 mm) in width. The predominant color for other barricade components shall be white, orange, or silver.

The top and bottom rails shall be continuous to allow for detection for hand trailing and cane trailing, respectively.

The faces of the barricade rails shall be vertical.”

80285

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.

80143

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.”

80273

WARM MIX ASPHALT (BDE)

Effective: January 1, 2012

Description. This work shall consist of designing, producing and constructing Warm Mix Asphalt (WMA) in lieu of Hot Mix Asphalt (HMA) for N30, N50, and N70 mixtures 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 ± 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.

“(d) 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. Additional mixture verification requirements include Hamburg Wheel testing according to Illinois Modified AASHTO T324 and tensile strength testing according to Illinois Modified AASHTO T283 which shall meet the criteria in Tables 1 and 2 respectively herein. The Contractor shall provide the additional material as follows:
 - a. Four gyratory specimens to be prepared in the Contractor’s lab according to Illinois Modified AASHTO T324.
 - b. Sufficient mixture to conduct tensile strength testing according to Illinois Modified AASHTO T283.

Table 1. Illinois Modified AASHTO T324 Requirements ^{1/}

Asphalt Binder Grade	# Wheel Passes	Max Rut Depth in. (mm)
PG 76-XX	20,000	1/2 in. (12.5 mm)
PG 70-XX	15,000	1/2 in. (12.5 mm)
PG 64-XX	10,000	1/2 in. (12.5 mm)

PG 58-XX		
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1/ Loose WMA shall be oven aged at 270 ± 5 °F (132 ± 3 °C) for two hours prior to gyratory compaction of Hamburg Wheel specimens.

Table 2. Tensile Strength Requirements

Asphalt Binder Grade	Tensile Strength psi (kPa)	
	Minimum	Maximum
PG 76-XX	80 (552)	200 (1379)
PG 70-XX		
PG 64-XX	60 (414)	200 (1379)
PG 58-XX		

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 mix of a new mixture design, at the beginning of each production season, and at every plant utilized to produce mixtures, regardless of the mix.”

Insert the following after the sixth paragraph of Article 1030.06(a) of the Standard Specifications:

“Warm mix technologies shall be as follows.

- (1) Mixture sampled to represent the test strip shall include additional material sufficient for the Department to conduct Hamburg Wheel testing according to Illinois Modified AASHTO T324 and tensile strength testing according to Illinois Modified AASHTO T283 (approximately 110 lb (50 kg) total).
- (2) Upon completion of the start-up, WMA production shall cease. The Contractor may revert to HMA production provided a start-up has been previously completed for the current construction season for the mix design. WMA may resume once all the test results, including Hamburg Wheel results are completed and found acceptable by the Engineer.”

Add the following after the first paragraph of Article 1030.05(d)(2)c. of the Standard Specifications:

“During production of each WMA mixture or HMA utilizing WMA technologies, the Engineer will request a minimum of one randomly located sample, identified by the Engineer, for Hamburg Wheel testing to determine compliance with the requirements specified in Table 1 herein.”

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		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 Gyratory 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 ± 5 °F (132 ± 3 °C) for quality control testing. The WMA compaction temperature for quality assurance testing will be 270 ± 5 °F (132 ± 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.

80288

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.

80302

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.