

If you plan to submit a bid directly to the Department of Transportation

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.

REQUESTS FOR AUTHORIZATION TO BID

Contractors downloading and/or ordering CD-ROM's and are 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 124INT) and the ORIGINAL, signed and notarized, "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.

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.

WHAT CONSTITUTES WRITTEN AUTHORIZATION TO BID?: When a prospective prime bidder submits a "Request for Authorization to Bid/or Not For Bid Status" (BDE 124INT) 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 a **Proposal Denial and/or Authorization Form**, approved by the Central Bureau of Construction, that indicates which items have been approved For Bidding. If **Authorization to Bid** cannot be approved, the **Proposal Denial and/or Authorization Form** will indicate the reason for denial.

ABOUT AUTHORIZATION TO BID: Firms that have not received an authorization form within a reasonable time of complete and correct original document submittal should contact the department as to status. This is critical in the week before the letting. These documents must be received three days before the letting date. Firms unsure as to authorization status should call the Prequalification Section of the Bureau of Construction at the number listed at the end of these instructions.

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

Each addendum will be placed with the contract number. Addenda will also be placed on the Addendum/Revision Checksheet and each subscription service subscriber will be notified by e-mail of each addendum 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 bidder check IDOT's website <http://www.dot.il.gov/desenv/delett.html> before submitting final bid information.

IDOT is not responsible for any e-mail related 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 Roseanne Nance (217)-785-5875 or nancer@dot.il.gov

WHAT MUST BE INCLUDED WHEN BIDS ARE SUBMITTED?: Bidders need not return the entire proposal when bids are submitted. That portion of the proposal that must be returned includes the following:

1. All documents from the Proposal Cover Sheet through the Proposal Bid Bond
2. Other special documentation and/or information that may be required by the contract special provisions

All proposal documents, including Proposal Guaranty Checks or Proposal Bid Bonds, should be stapled together to prevent loss when bids are processed by IDOT personnel.

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

WHO SHOULD BE CALLED IF ASSISTANCE IS NEEDED?

Questions Regarding	Call
Prequalification and/or Authorization to Bid	217/782-3413
Preparation and submittal of bids	217/782-7806
Mailing of plans and proposals	217/782-7806
Electronic plans and proposals	217/785-5875

ADDENDUMS TO THE PROPOSAL FORMS

Planholders should verify that they have received and incorporated the revisions prior to submitting their bid. Failure by the bidder to include an addendum could result in a bid being rejected as irregular.

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RETURN WITH BID

Proposal Submitted By
Name
Address
City

Letting January 21, 2005

BIDDERS NEED NOT RETURN THE ENTIRE PROPOSAL
(See instructions inside front cover)

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.

(SEE INSTRUCTIONS ON THE INSIDE OF COVER)

Notice To Bidders, Specifications, Proposal, Contract and Contract Bond



Illinois Department
of Transportation

Springfield, Illinois 62764

Contract No. 62840
COOK County
Section 2004-099TS
Route FAI 90/94
Project IM-943(370)58
District 1 Construction Funds

PLEASE MARK THE APPROPRIATE BOX BELOW:

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

Prepared by

F

Checked by

(Printed by authority of the State of Illinois)

INSTRUCTIONS

ABOUT IDOT PROPOSALS: All proposals issued by IDOT are potential bidding proposals. Each proposal contains all Certifications and Affidavits, a Proposal Signature Sheet and a Proposal Bid Bond required for Prime Contractors to submit a bid after written **Authorization to Bid** has been issued by IDOT's Central Bureau of Construction.

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. To request authorization, a potential bidder must complete and submit Part B of the Request for Authorization to Bid/or Not For Bid Status form (BDE 124 INT) and submit an original Affidavit of Availability (BC 57).

WHAT CONSTITUTES WRITTEN AUTHORIZATION TO BID?: When a prospective prime bidder submits a "Request for Proposal Forms and Plans" 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 a **Proposal Denial and/or Authorization Form**, approved by the Central Bureau of Construction, that indicates which items have been approved For Bidding. If **Authorization to Bid** cannot be approved, the **Proposal Denial and/or Authorization Form** will indicate the reason for denial. If a contractor has requested to bid but has not received a **Proposal Denial and/or Authorization Form**, they should contact the Central Bureau of Construction in advance of the letting date.

WHAT MUST BE INCLUDED WHEN BIDS ARE SUBMITTED?: Bidders need not return the entire proposal when bids are submitted. That portion of the proposal that must be returned includes the following:

1. All documents from the Proposal Cover Sheet through the Proposal Bid Bond
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Mailing of CD-ROMS	217/782-7806

RETURN WITH BID



PROPOSAL

TO THE DEPARTMENT OF TRANSPORTATION

1. Proposal of _____

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

**Contract No. 62840
COOK County
Section 2004-099TS
Project IM-943(370)58
Route FAI 90/94
District 1 Construction Funds**

Traffic signal modernization and roadway lighting improvements along I-90/94 (Dan Ryan Expressway) at 63rd Street between South Wentworth Avenue and Wells Street in Chicago.

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

BD 354 (Rev. 11/2001)

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. **CERTIFICATE OF AUTHORITY.** The undersigned bidder, if a business organized under the laws of another State, assures the Department that it will furnish a copy of its certificate of authority to do business in the State of Illinois with the return of the executed contract and bond. Failure to furnish the certificate within the time provided for execution of an awarded contract may be cause for cancellation of the award and forfeiture of the proposal guaranty to the State.

ILLINOIS DEPARTMENT OF TRANSPORTATION
 SCHEDULE OF PRICES
 CONTRACT
 NUMBER - 62840

State Job # - C-91-364-04
 PPS NBR - 1-74823-1405
 County Name - COOK- -
 Code - 31 - -
 District - 1 - -
 Section Number - 2004-099TS

Project Number
 IM-094-3/370/058

Route
 FAI 90/94

Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
XX004046	AERIAL CABLE REMOVAL	FOOT	226.000				
XX004684	REP&REPL DAMAGED COND	FOOT	65.000				
X0301898	E MAN 3'X4'X4' W24F&L	EACH	1.000				
X0320001	PVC CON T 2 (S40)	FOOT	103.000				
X0320080	ROD & CL DUCT EX COND	FOOT	644.000				
X0322256	TEMP INFO SIGNING	SQ FT	102.800				
X0322679	C FDN TY P BM TS CONT	EACH	2.000				
X0322692	P S AB 12.5 3G 34'-6"	EACH	1.000				
X0322695	MAST ARM STL ST LT 12	EACH	2.000				
X0322703	TRIPLX CC 2#6 & 1#8	FOOT	386.000				
X0322724	CONC FDN ST LT CONTR	EACH	2.000				
X0324223	MAINT EX LTG SYS	L SUM	1.000				
X0324225	CONTR TRAF 16LB P CAB	EACH	2.000				
X0324354	TR & BKFIL W SCRNSND	FOOT	603.000				
X0324412	C F 24D 1.25AR 15BC	FOOT	7.000				

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X0324416	CONV STR LT U FDN MT	EACH	1.000				
X0324420	PVC CON T 4 (S40)	FOOT	54.000				
X0324421	RACK CABLE IN MAN/HH	EACH	11.000				
X0324424	TR & BKFIL W SCR/SOIL	FOOT	37.000				
X0324434	REM EX ST LT UNIT FDN	EACH	1.000				
X0324435	CLEAN EX MAN/HAND	EACH	10.000				
X0324478	PVC CON T 3 (S40)	FOOT	140.000				
X0324487	C F 30D 1.5AR 16.5BC	FOOT	11.000				
X0324520	VID SY DET CAM/PROCES	EACH	2.000				
X0324522	REMOV EX HAND/MAN	EACH	1.000				
X0324523	REM FDN BASE MTD CONT	EACH	1.000				
X0324648	INNERDUCT CON 1-1/4	FOOT	579.000				
X0324649	CAB WK SPLIC/TEST/MIS	EACH	2.000				
X0324650	STAR MODEM	EACH	1.000				
X0324651	FO HYB CABLE 6SM/6MM	EACH	639.000				

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Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
X0324652	TRACER CABLE	FOOT	579.000				
X0324653	REMOV TR SIG POLE FDN	EACH	1.000				
X0324699	SPL EX/REPL C CTA TRK	FOOT	54.000				
X0324844	TEMP LIGHTING UNIT	EACH	2.000				
X0329863	INTERCEPT EX CONDUIT	EACH	2.000				
X0329887	SERV INSTALL 200 AMP	EACH	2.000				
X0933900	PVC CON T 3 (S80)	FOOT	694.000				
X0935100	MA STL MONOTUBE 35	EACH	1.000				
X0935700	ELCBL C 12 19C	FOOT	1,086.000				
X0962500	REMOV EX TS EQUIP	L SUM	1.000				
X0966510	SN MESS E-ILUM FO MAM	EACH	4.000				
X0966520	SN MESS E-ILLUM FO BM	EACH	4.000				
X0966700	JUNC BOX POLE/POST MT	EACH	3.000				
X7015000	CHANGEABLE MESSAGE SN	CAL MO	32.000				
X8210450	LUM SL HPS 310W 240V	EACH	3.000				

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Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
X8250005	CONTROLLER STREET LGT	EACH	2.000				
X8510250	PT EX POLE/POST/CONTR	EACH	17.000				
X8730005	ELCBL C 4 1C	FOOT	740.000				
X8730015	ELCBL C 8 1C	FOOT	370.000				
X8730020	ELCBL C 2/0 1/C	FOOT	702.000				
X8730570	EC C COAX VID RG 59/U	FOOT	197.000				
X8801300	SH P LED 1F 3S BM	EACH	5.000				
X8801310	SH P LED 1F 3S MAM	EACH	10.000				
X8801345	SH P LED 1F 4S BM	EACH	2.000				
X8801350	SH P LED 1F 4S MAM	EACH	2.000				
X8810395	PED SH P LED 1F BM	EACH	12.000				
X8950062	REM CONTR FDN TYPE A	EACH	1.000				
X8950075	REMOV EX LTG CONT SAL	EACH	2.000				
Z0013798	CONSTRUCTION LAYOUT	L SUM	1.000				
Z0018940	DRILL EX MAN/HANDHOLE	EACH	36.000				

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Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
Z0048665	RR PROT LIABILITY INS	L SUM	1.000				
67100100	MOBILIZATION	L SUM	1.000				
70102635	TR CONT & PROT 701701	L SUM	1.000				
70102640	TR CONT & PROT 701801	L SUM	1.000				
80700110	GROUND ROD 3/4 X 10	EACH	3.000				
81000300	CON T 1 GALVS	FOOT	144.000				
81800200	A CBL 2-1C4 MESS WIRE	FOOT	226.000				
84200500	REM EX LT UNIT SALV	EACH	2.000				
85000300	MAIN EX TR SIG INSTAL	L SUM	1.000				
86400100	TRANSCEIVER - FIB OPT	EACH	2.000				
89000100	TEMP TR SIG INSTALL	EACH	2.000				

CONTRACT NUMBER

62840

THIS IS THE TOTAL BID

\$ _____

NOTES:

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

RETURN WITH BID

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

I. GENERAL

A. Article 50 of the Illinois Procurement Code establishes the duty of all State chief procurement officers, State purchasing officers, 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. By execution of the Proposal Signature Sheet, the bidder indicates that each of the mandated assurances has 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 termination of the contract and the suspension or debarment of the bidder.

II. ASSURANCES

A. 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. The Department may terminate the contract if it is later determined that the bidder rendered a false or erroneous assurance, and the surety providing the performance bond shall be responsible for the completion of the contract.

B. Felons

1. The Illinois Procurement 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 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. The bidder assures the Department that the award and execution of the contract would not cause a violation of Section 50-10.

C. Conflicts of Interest

1. The Illinois Procurement 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 \$150,700.00. Sixty percent of the salary is \$90,420.00.

RETURN WITH BID

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.

D. Negotiations

1. The Illinois Procurement 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.

E. Inducements

1. The Illinois Procurement 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.

F. Revolving Door Prohibition

1. The Illinois Procurement Code provides:

Section 50-30. Revolving door prohibition. Chief procurement officers, associate procurement officers, State purchasing officers, 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.

G. Reporting Anticompetitive Practices

1. The Illinois Procurement Code provides:

Section 50-40. Reporting anticompetitive practices. When, for any reason, any vendor, bidder, contractor, chief procurement officer, State purchasing officer, 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 chief procurement officer.

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.

H. Confidentiality

1. The Illinois Procurement Code provides:

Section 50-45. Confidentiality. Any chief procurement officer, State purchasing officer, 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.

RETURN WITH BID

I. Insider Information

1. The Illinois Procurement Act 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

A. 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. The Department may terminate the contract if it is later determined that the bidder rendered a false or erroneous certification, and the surety providing the performance bond shall be responsible for completion of the contract.

B. Bribery

1. The Illinois Procurement 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 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, 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 shall contain a certification by the contractor that the contractor is not barred from being awarded a contract or subcontract under this Section. A contractor who makes a false statement, material to the certification, commits a Class 3 felony.

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

C. 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.

D. 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.

RETURN WITH BID

(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.

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.

E. 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.

F. 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.

G. Debt Delinquency

1. The Illinois Procurement Code provides:

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

The contractor or bidder certifies that it, or any affiliate, is not barred from being awarded a contract under 30 ILCS 500. Section 50-11 prohibits a person from entering into a contract with a State agency 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 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 contractor further acknowledges that the contracting State agency may declare the contract void if this certification is false or if the contractor, or any affiliate, is determined to be delinquent in the payment of any debt to the State during the term of the contract.

H. Sarbanes-Oxley Act of 2002

1. The Illinois Procurement Code provides:

Section 50-60(c).

The contractor 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 for a period of five years prior to the date of the bid or contract. The contractor acknowledges that the contracting agency shall declare the contract void if this certification is false.

I. ADDENDA

The contractor or bidder certifies that all relevant addenda have been incorporated in to this contract. Failure to do so may cause the bid to be declared unacceptable.

J. Section 42 of the Environmental Protection Act

The contractor certifies in accordance with 30 ILCS 500/50-12 that the bidder or contractor is not barred from being awarded a contract under this Section which prohibits the bidding on or entering into contracts with the State of Illinois or a State agency 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 contractor acknowledges that the contracting agency may declare the contract void if this certification is false.

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

In accordance with the provisions of Section 30-22 (6) of the Illinois Procurement 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 each of its subcontractors. Unless otherwise directed in writing by the Department, 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 may be indicated as to be subcontracted.

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.

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 Department may terminate the contract if it is later determined that the bidder rendered a false or erroneous disclosure, 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 Illinois Procurement Code provides that all bids of more than \$10,000 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.

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 400 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.

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. Subject individuals should be covered each by one form. In addition, a second form (Disclosure Form B) provides for the disclosure of current or pending procurement relationships with other (non-IDOT) state agencies. **The forms must be included with each bid or incorporated by reference.**

C. Disclosure Form Instructions

Form A: For bidders that have previously submitted the information requested in Form A

The Department has retained the Form A disclosures submitted by all bidders responding to these requirements for the April 24, 1998 or any subsequent letting conducted by the Department. The bidder has the option of submitting the information again or the bidder may sign the following certification statement indicating that the information previously submitted by the bidder is, as of the date of signature, current and accurate. The Certification must be signed and dated by a person who is authorized to execute contracts for the bidding company. Before signing this certification, the bidder should carefully review its prior submissions to ensure the Certification is correct. If the Bidder signs the Certification, the Bidder should proceed to Form B instructions.

CERTIFICATION STATEMENT

I have determined that the Form A disclosure information previously submitted is current and accurate, and all forms are hereby incorporated by reference in this bid. Any necessary additional forms or amendments to previously submitted forms are attached to this bid.

(Bidding Company)

Name of Authorized Representative (type or print)

Title of Authorized Representative (type or print)

Signature of Authorized Representative

Date

Form A: For bidders who have NOT previously submitted the information requested in Form A

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 400 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 the second page of 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 \$90,420.00? YES ___ NO ___
3. Does anyone in your organization receive more than \$90,420.00 of the bidding entity's or parent entity's distributive income? (Note: Distributive income is, for these purposes, any type of distribution of profits. An annual salary is not 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 \$90,420.00? 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 on page 2 of Form A must be signed and dated by a person that is authorized to execute contracts for your company.

Form B: Identifying Other Contracts & Procurement Related Information Disclosure Form B must be completed for each bid submitted by the bidding entity. It must be signed by an individual who is authorized to execute contracts for the bidding entity. *Note: Signing the NOT APPLICABLE STATEMENT on Form A does not allow the bidder to ignore Form B. Form B must be completed, signed 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 signature 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.

D. Bidders Submitting More Than One Bid

Bidders submitting multiple bids may submit one set of forms consisting of all required Form A disclosures and one Form B for use with all bids. Please indicate in the space provided below the bid item that contains the original disclosure forms and the bid items which incorporate the forms by reference.

- The bid submitted for letting item _____ contains the Form A disclosures or Certification Statement and the Form B disclosures. The following letting items incorporate the said forms by reference:

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**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 Illinois Procurement 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 \$10,000, 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.**

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 \$90,420.00 (60% of the Governor's salary as of 7/1/01). **(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 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 \$90,420.00, (60% of the Governor's salary as of 7/1/01) provide the name the State agency for which you are employed and your annual salary. _____

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- 3. If you are currently appointed to or employed by any agency of the State of Illinois, and your annual salary exceeds \$90,420.00, (60% of the Governor's salary as of 7/1/01) 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 the 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 \$90,420.00, (60% of the Governor's salary as of 7/1/01) 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 2 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 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 \$90,420.00, (60% of the Governor's salary as of 7/1/01) 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 \$90,420.00, (60% of the salary of the Governor as of 7/1/01) 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 the 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 \$90,420.00, (60% of the Governor's salary as of 7/1/01) 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 2 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 ___

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(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 ___

APPLICABLE STATEMENT

This Disclosure Form A is submitted on behalf of the INDIVIDUAL named on previous page.

Completed by: _____
Name of Authorized Representative (type or print)

Completed by: _____
Title of Authorized Representative (type or print)

Completed by: _____ Date _____
Signature of Individual or Authorized Representative

NOT APPLICABLE STATEMENT

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.

Name of Authorized Representative (type or print)

Title of Authorized Representative (type or print)

Signature of Authorized Representative Date _____

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**ILLINOIS DEPARTMENT
OF TRANSPORTATION**

**Form B
Other Contracts &
Procurement 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 Illinois Procurement Act (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 \$10,000, 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 SIGNED

Name of Authorized Representative (type or print)	

Title of Authorized Representative (type or print)	
_____	_____
Signature of Authorized Representative	Date

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. 62840
 COOK County
 Section 2004-099TS
 Project IM-943(370)58
 Route FAI 90/94
 District 1 Construction Funds**

PART I. IDENTIFICATION

Dept. Human Rights # _____ Duration of Project: _____

Name of Bidder: _____

PART II. WORKFORCE PROJECTION

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

TABLE A

TOTAL Workforce Projection for Contract													
JOB CATEGORIES	TOTAL EMPLOYEES		MINORITY EMPLOYEES						TRAINEES				
			BLACK		HISPANIC		*OTHER MINOR.		APPRENTICES		ON THE JOB TRAINEES		
	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													

TABLE B

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								

FOR DEPARTMENT USE ONLY

*Other minorities are defined as Asians (A) or Native Americans (N).

Please specify race of each employee shown in Other Minorities column.

Note: See instructions on the next page

RETURN WITH BID

**Contract No. 62840
COOK County
Section 2004-099TS
Project IM-943(370)58
Route FAI 90/94
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. 62840
COOK County
Section 2004-099TS
Project IM-943(370)58
Route FAI 90/94
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 _____

(IF A JOINT VENTURE, USE THIS SECTION FOR THE MANAGING PARTY AND THE SECOND PARTY SHOULD SIGN BELOW) Attest _____
Signature _____
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



Illinois Department of Transportation

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 Article 102.09 of the "Standard Specifications for Road and Bridge Construction" in effect on the date of 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)
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 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

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 323
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. 62840
COOK County
Section 2004-099TS
Project IM-943(370)58
Route FAI 90/94
District 1 Construction Funds**



Illinois Department of Transportation



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., January 21, 2005. 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. 62840
COOK County
Section 2004-099TS
Project IM-943(370)58
Route FAI 90/94
District 1 Construction Funds**

Traffic signal modernization and roadway lighting improvements along I-90/94 (Dan Ryan Expressway) at 63rd Street between South Wentworth Avenue and Wells Street in Chicago.

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

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

By Order of the
Illinois Department of Transportation

Timothy W. Martin, Secretary

BD 351 (Rev. 01/2003)

INDEX
FOR
SUPPLEMENTAL SPECIFICATIONS
AND RECURRING SPECIAL PROVISIONS

Adopted January 1, 2004

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

ERRATA Standard Specifications for Road and Bridge Construction
(Adopted 1-1-02) (Revised 1-1-04)

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STATE OF ILLINOIS

SPECIAL PROVISIONS

The following Special Provisions supplement the "Standard Specifications for Road and Bridge Construction," adopted January 1, 2002, the latest edition of the "Manual on Uniform Traffic Control Devices for Streets and Highways," and the "Manual of Test Procedures for Materials" in effect on the date of invitation for bids, and the Supplemental Specifications and Recurring Special Provisions indicated on the Check Sheet included herein which apply to and govern the construction of FAI 90/94 (I-90/94), Section 2004-099TS, Project IM-094-3(370)058 County: Cook and in case of conflict with any part or parts of said Specifications, the said Special Provisions shall take precedence and shall govern.

LOCATION OF PROJECT

The project extends along 63rd Street from approximately 85 feet west of Wells Street baseline to approximately 35 feet east of Wentworth Avenue baseline in the City of Chicago, in Cook County.

DESCRIPTION OF PROJECT

The project consists of traffic signal modernizations and roadway street lighting improvements along 63rd Street between S. Wentworth Avenue and S. Wells Street.

UTILITY COORDINATION - CITY OF CHICAGO

Effective: September 30, 1985

Revised: November 1, 1996

The City of Chicago is to make adjustments to their street lighting and/or traffic signal facilities. The Contractor shall coordinate his work and cooperate with the City of Chicago in these adjustments.

This coordination and cooperation by the Contractor will not be paid for separately but shall be considered included in the costs of the contract.

COMPLETION DATE PLUS GUARANTEED WORKING DAYS

The Contractor shall complete all contract items and safely open all roadways to traffic by 11:59 PM on, November 23, 2005 except as specified herein.

Article 108.09 of the Standard Specifications 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.

COORDINATION WITH ADJACENT AND/OR OVERLAPPING CONTRACTS

This Contract abuts and/or overlaps with other concurrent Contracts as listed below. Each Contract includes work items requiring close coordination between the Contractors regarding the sequence and timing for the execution of such work items.

Contract Number 62693
Contract Number 62835
Contract Number 62836
Contract Number 62842

Supplemental to the requirements of the Standard Specifications Article 105.08-Cooperation Between Contractors, the Contractors shall identify all such work items at the beginning of the Contract, and coordinate sequence and timing for their execution with the other Contractors through the Engineer. These work items shall be identified as separate line items in the Contractors' proposed Construction and Progress Schedule. Any conflicts between Contractors' schedules, the Department will be consulted through the Engineer to determine a resolution. Additional compensation or extension of the contract time will not be allowed for work and/or progress and/or lack of progress affected by lack of such coordination by the Contractor.

CONTRACTOR COOPERATION

The Contractor's attention is directed to the fact that other separate contracts may be under construction during the duration of this Contract and that the Contractor will be governed by Article 105.08 of the Standard Specifications.

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

No additional compensation will be allowed the Contractor for the above requirements or for any delays or inconvenience resulting from the activities of other contractors.

TRAFFIC CONTROL PLAN

Effective: September 30, 1985

Revised: October 1, 1995

Traffic Control shall be in accordance with 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.

HIGHWAY STANDARDS

701701	Urban Lane Closure Multilane Intersection
701801	Lane Closure Multilane 1W or 2W Crosswalk or Sidewalk Closure
702001	Traffic Control Devices

PLANS AND DETAILS

TC-22	Temporary Information Signing
-------	-------------------------------

RECURRING SPECIAL PROVISIONS AND SPECIAL PROVISIONS

Advanced Public Notification
Flagger Vests (BDE)
Personal Protective Equipment (BDE)
Temporary Concrete Barrier (BDE)
Temporary Information Signing
Traffic Control Deficiency Deduction (BDE)
Work Zone Traffic Control Devices (BDE)

ADVANCED PUBLIC NOTIFICATION

The Contractor shall provide notice to the public a minimum of 14 days in advance of any work that requires the closure of lanes or ramps through the use of a changeable message sign or temporary information signing.

TEMPORARY INFORMATION SIGNING

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

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

	<u>Item</u>	<u>Article/Section</u>
a)	Sign Base (Notes 1 & 2)	1090
b)	Sign Face (Note 3)	1091
c)	Sign Legends	1092
d)	Sign Supports	1093
e)	Overlay Panels (Note 4)	1090.01

- Note 1. The Contractor may use 16mm (5/8 inch) instead of 19mm (3/4 inch) thick plywood.
- Note 2. Type A sheeting can be used on the plywood base.
- Note 3. All sign faces shall be Type A except all orange signs shall meet the requirements of Article 1084.02(b).
- Note 4. The overlay panels shall be 2mm (0.08 inch) thick.

GENERAL CONSTRUCTION REQUIREMENTS

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

Signs which are placed along the roadway and/or within the construction zone shall be installed according to the requirements of Article 702.05 and Article 720.04. The signs shall be 2.1m (7') above the near edge of the pavement and shall be a minimum of 600mm (2') beyond the edge of the paved shoulder. A minimum of 2 posts shall be used.

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

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

Method of Measurement. This Work shall be measured for payment in square feet edge to edge (horizontally and vertically).

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

Basis of Payment. This Work will be paid for at the contract unit price per square feet for TEMPORARY INFORMATION SIGNING, which price shall be full compensation for all labor, equipment and materials required for performing the work as herein specified.
(CTE – 10/15/2004)

CHANGEABLE MESSAGE SIGNS

This item shall conform to the Recurring Special Provision for "Portable Changeable Message Signs:

Four (4) signs will be required for this contract.

CONSTRUCTION AIR QUALITY - DUST CONTROL

Description. This work shall consist of developing and implementing a detailed Dust Control Plan (DCP). Development of a DCP is required in "Non-attainment" and "Maintenance" areas, per Article 107.36 of the Standard Specifications. All construction activities shall be governed by the DCP. The nature and extent of dust generating activities, and specific control techniques appropriate to specific situations shall be discussed at the pre-construction meeting, with subsequent development of the DCP to include but not be limited to the requirements below.

The Contractor is responsible for the control of dust at all times during the duration of the contract, 24 hours per day, 7 days per week, including non-working hours, weekends, and holidays. This work shall be considered complete after the completion of all permanent erosion control measures required for the contract, and after all temporary and permanent seeding has taken place. Work on this contract shall be conducted in a manner that will not result in generating excessive air borne particulate matter (PM) or nuisance dust conditions.

The DCP shall include legible copies of the product literature and Material Safety Data Sheets for dust suppression agents and stabilizers the contractor proposes to use. The Dust Control Plan shall involve the implementation of control measures before, during and after conducting any dust generating operation. These controls must be in place on non-working days and after working hours, not just while work is being done on the site. The Dust Control Plan must contain information specific to the project site, proposed work, and dust control measures to be implemented. A copy of the Dust Control Plan must be available on the project site at all times.

The Dust Control Plan must contain, at a minimum, all of the following information:

Name, address and phone number of the person(s) responsible for the dust generating operation and for the submittal and implementation of the Dust Control Plan.

A drawing specifying the site boundaries of the project with the areas to be disturbed, the locations of the nearest public roads, and all planned exit and entrance locations to the site from any paved public roadways.

Control measures to be applied to all actual and potential fugitive dust sources before, during and after conducting any dust generating operation, including non-work hours and non-work days.

A list of dust suppressants to be applied, including product specifications, Material Safety Data Sheets, and product label instructions that include the method, frequency and intensity of applications; and information on the environmental impacts and approval or certifications related to the appropriate and safe use for ground applications.

A contingency plan consisting of at least one contingency measure for each activity occurring on the site in case the primary control measure proves inadequate.

The Contractor shall submit two copies of the DCP that outlines in detail the measures to be implemented by the Contractor complying with this section, including prevention, cleanup, and other measures at least 14 days before beginning any dust generating activity. The Contractor shall not begin any dust generating activities until the Engineer approves the DCP in writing. Failure to comply with the DCP or provisions herein will subject the contractor to an "Environmental Deficiency Deduction," as outlined below.

Materials

1. Dust Suppression Agents

Dust suppression agents shall be water soluble, non-toxic, non-reactive, non-volatile, and non-foaming. The use of petroleum for dust control is prohibited.

Calcium Chloride shall conform to the requirements of Article 1013.01 of the Standard Specifications. Other commercially available dust suppression agents may be substituted for calcium chloride subject to the approval of the Engineer. Material Safety Data Sheets must be reviewed and approved by the Engineer prior to the use of any substances other than Calcium Chloride.

Water shall meet the requirements of Article 1002 of the Standard Specifications.

2. Soil stabilizers shall consist of seed and mulch meeting the requirements of Article 1081.06 (a) (2) and (3).

3. Covers for stockpiles shall be commercially available plastic tarps, or other materials approved by the Engineer.

Construction Methods. Dust suppression agents shall be used to provide temporary control of dust on haul roads and other active work areas. Several applications per day may be necessary to control dust depending upon meteorological conditions and work activity. The Contractor shall apply dust suppression on a routine basis as necessary or as directed by the Engineer to control dust. Wet suppression consists of the application of water or a wetting agent in solution with water. Wetting agents shall not be applied directly to live plant material. Wet suppression equipment shall consist of sprinkler pipelines, tanks, tank trucks or other devices approved by the Engineer, capable of providing a regulated flow, uniform spray and positive shut off.

Calcium chloride dust suppression agents may be used in lieu of wet suppression only when freezing conditions exist. Calcium chloride shall be uniformly applied by a mechanical spreader at a rate of 1 and 1/2 pounds per square yard or its equivalent liquid, unless otherwise directed by the Engineer. Calcium chloride shall not be directly applied to live plant material.

Calcium chloride must not be stored outdoors without an impermeable cover. Storage must be on an impermeable surface such as paved asphalt or appropriately treated concrete of sufficient thickness to avoid exfiltration. Storage should be as airtight as possible to limit the calcium chloride's absorbing moisture from the air. No storage facilities will be allowed within 100 feet of a storm sewer, or any other drain. Positive drainage must be maintained on all treated surfaces. Ditches, culverts and other structures must be kept clean to ensure proper drainage and to limit the amount of water infiltrating earth surfaces and thereby leeching out chlorides. If calcium chloride is applied dry, or during dry periods, and crystals are seen on the road surface, the road should be wetted sufficiently to dissolve the calcium chloride. Wetting should be limited to an amount that will sufficiently cause the calcium chloride to penetrate the surface but not to the point of causing any runoff from the road surface. Other approved dust suppression agents shall be applied and used as per the manufacturer's instructions.

Haul truck cargo areas shall be securely covered during the transport of materials on public roadways that are prone to cause dust.

Public Roadway Dust Control. Track out, including carryout and spillage of material that adheres to the exterior surfaces of or are spilled from motor vehicles and/or equipment and subsequently fall onto a

paved public roadway must be controlled at all times. Clean up of carryout and spillage is required immediately if it extends a cumulative distance of 50 feet or more on a paved public roadway. If the extent of carryout is less than 50 feet, clean up at the end of the day is permissible. Clean up of paved surfaces shall be by wet spray power vacuum street sweeper. Dry power sweeping is prohibited.

Control of earthwork dust. During batch drop operations (i.e. earthwork with a front-end loader, clamshell bucket, or backhoe), the free drop height of excavated or aggregate material shall be reduced to minimum heights as necessary to perform the specified task, and to minimize the generation of dust. To prevent spills during transport, a minimum of 2 inches of freeboard space shall be maintained between the material load and the top of the truck cargo bed rail. A maximum drop height of two feet (or minimum height allowed by equipment) will be allowed, or to heights as directed by the Engineer.

Control of dust on stockpiles and inactive work areas. The Contractor shall use the following methods to control dust and wind erosion of stockpiles and inactive areas of disturbed soil:

Dust suppression agents shall be used during active stockpile load-in, load-out, and maintenance activities.

Soil stabilizers (hydraulic or chemical mulch) shall be applied to the surface of inactive stockpiles and other inactive areas of disturbed soil. Final grading and seeding of inactive areas shall occur immediately after construction activity is completed in an area and as directed by the Engineer.

Plastic tarps may be used on small stockpiles, secured with sandbags or an equivalent method approved by the Engineer, to prevent the cover from being dislodged by the wind. The Contractor shall repair or replace the covers whenever damaged or dislodged at no additional cost.

Method of Measurement. All measuring devices shall be furnished by the Contractor and approved by the Engineer.

Calcium chloride and other approved dust suppression agents shall be mixed with water at the rate specified by the manufacturer and measured for payment in units of 1000 Gallons of solution applied.

The application of soil stabilizers shall be measured by weight (pounds) of soil stabilizer. The soil stabilizer will then be added to water to form a solution in accordance with the manufacturer's recommendation.

All other dust control measures will not be measured for payment.

Basis of Payment. The application of dust suppression agents shall be paid for at the contract unit price per unit for **APPLYING DUST SUPPRESSION AGENT**.

Soil stabilizers will be paid for at the contract price per pound for **SOIL STABILIZERS**.

All other dust control measures will not be paid for directly but shall be considered as included in the various items involved and no additional compensation will be allowed.

CONSTRUCTION AIR QUALITY–DIESEL VEHICLE EMISSIONS CONTROLS

Description. The reduction of emissions of Carbon Monoxide (CO), Hydrocarbons (HC), Nitrogen oxides (NOx), and Particulate Matter (PM) will be accomplished by installing Retrofit Emission Control Devices and/or by using cleaner burning diesel fuels. The term "equipment" refers to any and all diesel fuel powered devices rated at 50 Horse power (HP) and above, to be used on the project site for any length of time, (including any "rented" or "rental" equipment).

All Contractor and Sub-contractor diesel powered equipment with engine horsepower (HP) ratings of 50 HP and above, that are on the project or are assigned to the contract shall be prohibited from using "off-road" diesel fuel (above 500 parts per million (ppm) sulfur content) at any time. In addition, diesel powered equipment shall be either (1) retrofitted with Emissions Control Devices *and* use Cleaner burning "on-road" diesel fuel (500 ppm sulfur content or less), or (2) use Ultra Low Sulfur Diesel fuel (ULSD) exclusively (15 ppm sulfur content or less), in order to reduce diesel particulate matter emissions. Large cranes (Sky cranes or Link Belt cranes), which are responsible for critical lift operations are exempt from installing Retrofit Emission Control Devices if they adversely affect equipment operation.

In addition, all construction motor vehicles (both on-road and off-road, gasoline or diesel fuel powered) shall comply with all pertinent State and Federal regulations relative to exhaust emission controls and safety, including opacity. Frequently Asked Questions (FAQ's) regarding Illinois Environmental Protection Agency (IEPA) emissions testing for gasoline powered vehicles can be accessed at (www.epa.state.il.us/air/vim/faq/testing.html). Regulations regarding diesel powered vehicles over 16,000 pounds, and the Diesel Emission Inspection Program (Title 92: Transportation Part 460, Diesel Emission Inspection Program, Subpart A: General) can be accessed at (www.dot.state.il.us/regulations.html). Diesel powered vehicles less than 16,000 pounds are exempt from testing by IDOT. All diesel powered equipment used on the project site shall be subject to reasonable, random spot checks for compliance with the required emissions controls and proper diesel fuel usage. The Secretary of State, Illinois State Police and other law enforcement officers shall enforce Part 460. For additional information concerning Illinois diesel emission inspection requirements, please call the Illinois Department of Transportation, Diesel Emission Inspections Unit, at 217-557-6081.

The Retrofit Emission Control Devices shall consist of oxidation catalysts, or similar retrofit equipment control technology that (1) is included on the Environmental Protection Agency (EPA) *Verified Retrofit Technology List* (www.epa.gov/otaq/retrofit/retroverifiedlist.html) and (2) is verified by EPA or certified by the manufacturer via letter, to provide a minimum emissions reduction of 20% PM10, 40% CO, and 50% HC when used with "on-road" diesel fuel. As noted above, the Retrofit Emission Control Device *must be used with on-road diesel fuel* (500 ppm sulfur content or less).

If used, ULSD fuel shall conform to American Society for Testing and Materials (ASTM) D-975 diesel with the following additional specifications:

ASTM D-5453 15 ppm Sulfur max.
ASTM D-6078 Lubricity (SBOCLE) 3100 g min.
ASTM D-613 Cetane 45 min.
Dyed (for Off-road use)

Construction shall not proceed until the contractor submits a certified list of the diesel powered equipment that will be retrofitted with emission control devices and use "on-road" diesel fuel, and a list of equipment that will use ULSD fuel only. The list(s) shall include (1) the equipment number, type, make, and contractor/sub-contractor name; (2) the emission control devices make, model and EPA verification number; and (3) the type and source of clean fuels to be used. Vehicles reported as fitted with emissions control devices shall be made available to the Engineer for visual inspection of the device installation by qualified staff, prior to being used on the project site. 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 under "Environmental Deficiency Deduction."

The contractor shall submit monthly summary reports, updating the list of construction equipment, and include certified copies of the diesel fuel delivery slips (for both "on-road" and ULSD) for the reporting time period, noting the type of diesel fuel used with each piece of diesel powered equipment. The addition or deletion of any diesel powered equipment shall be included in the summary and noted on the monthly report.

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 given 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. Failure to comply with the "Diesel Vehicle Emission Controls", shall also subject the Contractor or sub-contractor to an "Environmental Deficiency Deduction," as outlined below.

Any costs associated with bringing any diesel powered equipment into compliance with these "Diesel Vehicle Emissions Controls" shall be included in the overall cost of the contract. In addition, there shall be no time granted to the contractor for compliance with this notice. The contractor's compliance with this notice and any associated regulations shall also not be grounds for a claim.

A. IDLING. The contractor shall establish truck-staging areas for all diesel powered vehicles that are waiting to load or unload material at the contract area. Such zones shall be located where the diesel emissions from the equipment will have a minimum impact on adjacent abutters and sensitive receptors of the general public. The Department will coordinate such locations with the Contractor and City Of Chicago authorities, including local aldermen, in the selection of staging areas, whether within or outside the existing highway right-of-way (ROW), 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. Idling of diesel powered equipment shall not be permitted during periods of non-active vehicle use. Diesel powered engines shall not be allowed to idle for more than five consecutive minutes when the equipment is not in use, occupied by an operator, or otherwise in motion, except only as follows:

When the equipment is forced to remain motionless because of traffic conditions or mechanical difficulties over which the operator has no control;

When it is necessary to operate auxiliary systems installed on the equipment, only when such system operation is necessary to accomplish the intended use of the equipment;

To bring the equipment to the manufacturer's recommended operating temperature;

When the outdoor temperature is below forty-five (45) degrees Fahrenheit or above eighty (80) degrees Fahrenheit;

When the equipment is being repaired.

All work shall be conducted to ensure that no harmful effects are caused to adjacent sensitive receptors. Equipment and equipment operators found in non-compliance with these idling provisions shall receive a warning, and on the next offense be subject to an Environmental Deficiency Deduction as outlined below. The contractor or sub-contractor may reserve the right to enforce this deduction on their own equipment operator, as necessary.

B. MITIGATION. Air quality monitoring will be conducted throughout the course of the Dan Ryan reconstruction project, by a separate air quality consultant. The contractor shall designate a point person to be responsive to IDOT in the event construction related air quality issues arise. If the ongoing monitoring detects an adverse air quality issue that is due to, or exacerbated by construction activities, the contractors point person will be required to consult with the Engineer, to determine the appropriate course of action.

Appropriate mitigation measures can include a variety of actions ranging from, but not limited to additional watering, removal of construction equipment from nearby sensitive receptors, shut down of diesel powered equipment, or other mitigation measures which may be required as data becomes available and as approved by the Engineer.

Method of Measurement and Basis of Payment:

The **CONSTRUCTION AIR QUALITY – DIESEL EMISSIONS CONTROLS** will not be measured for payment and the cost of this work shall be included in the unit prices bid and no additional compensation will be allowed.

CONSTRUCTION NOISE MITIGATION

Description. This work shall consist of implementing construction noise restrictions as outlined in a project Construction Noise Mitigation plan. Work on the project shall be in accordance with the Construction Noise Mitigation plan submitted by the contractor, applicable sections of Article 107.35 of the Standard Specifications, and modifications as contained herein for construction noise.

The contractor must provide advance notification, and secure approval from the Engineer prior to the use of heavy construction equipment outside normal construction work hours ("normal construction work hours" as specified in Article 107.35 of the Standard Specifications). Inspection and maintenance of all vehicle exhaust systems shall be conducted on a monthly basis, (or as determined by the Engineer), for all such vehicles and other equipment assigned to or utilized on the project site. Inspections shall be conducted by personnel having a working knowledge of exhaust systems so that proper recommendations regarding the adequacy of the mufflers can be established.

Construction Equipment

Pavement Breakers create high concentrations of low frequency sound energy, and noise attenuation can be achieved through the introduction of high-mass material between the noise source and the receiver. The attachment of shrouds (sound curtains) to the steel frame around the breaker shall be installed, as equipment allows. The operation of pavement breakers shall be prohibited outside of normal work hours, as specified herein, unless otherwise approved by the Engineer.

Special care shall be taken with respect to the set up and operation of concrete batch and concrete crushing plants to minimize the potential noise impacts to the adjacent community. The Department will work with the Contractor and City Of Chicago authorities, including local aldermen in selecting construction concrete batch and/or crushing locations, whether within or outside the ROW, to avoid locations near sensitive areas or populations to the extent possible. All local, City, Village, Town and/or Township rules, regulations, and/or requirements regarding batch and crushing plants shall be followed, as instructed by the Engineer.

Compressors or generators shall be located as far away as possible from sensitive receptors. Compressors and generators shall be positioned such that the coding fan intake does not point towards the community. The Contractor shall review stationary equipment placement with the Engineer prior to commencement of work.

Method of Measurement and Basis of Payment:

The **CONSTRUCTION NOISE MITIGATION** will not be measured for payment and the cost of this work shall be included in the unit prices bid and no additional compensation will be allowed.

ENVIRONMENTAL DEFICIENCY DEDUCTION

To ensure a prompt response to incidents involving the integrity of work zone Environmental (Air Quality and Noise) Control, the Contractor shall provide a telephone number where a responsible individual can be contacted on a 24 hour a day basis.

When the Engineer is notified, or determines 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 frame. The specified time frame, 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.

The deficiency may include lack of repair, maintenance or non-compliance with the Special Provisions for Construction Air Quality Dust Control and/or Construction Noise Mitigation.

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 exists. The calendar day(s) will begin with Contractor's notification and end with the Engineer's acceptance of the correction. The daily monetary deduction will be either \$1,000.00 or 0.05 percent of the awarded contract value, whichever is greater.

In addition, if the Contractor or sub-contractor fails to respond within the allotted time frame, the Engineer may take action to correct the deficiency, or may cause the correction of the deficiency to be made by others, the cost thereof being deducted from monies due or which may become due the Contractor or sub-contractor. This corrective action will in no way relieve the Contractor or sub-contractor of his/her contractual requirements or responsibilities, and shall not be grounds for any claim.

If a Contractor or sub-contractor accumulates three (3) Deficiency Deductions for the same deficiency, in a contract period, the contractor will be shut down until the deficiency is corrected. Such a shut down will not be grounds for any extension of the completion date, waiver of penalties, or be grounds for any claim.

CONTRACTOR OFF-STREET PARKING RESTRICTION

The Contractor and all employees working on this project will not be allowed to park their vehicles and equipment on frontage roads or streets. The Contractor shall provide off-street parking facility for all vehicles and equipment. The Contractor shall also provide any transportation required to get his employees to and from the work site. The Contractor will provide the RE with written documentation of the off-site parking location.

The cost to comply with this requirement will not be paid for separately, but shall be considered as included in the contract unit bid prices of the contract, and no additional compensation will be allowed.

RAILROAD PROTECTIVE LIABILITY INSURANCE

Description. The Contractor will be required to carry Railroad Protective Liability and Property Damage Insurance in accordance with Article 107.11 of the Standard Specifications. The limits of liability shall be in accordance with Article 107.11 for the Standard Specifications unless otherwise noted. A separate policy is required for each railroad indicated below unless otherwise noted.

<u>NAMED INSURED & ADDRESS</u>	<u>NUMBER & SPEED OF PASSENGER TRAINS</u>	<u>NUMBER & SPEED OF FREIGHT TRAINS</u>
Chicago Transit Authority (CTA) 120 North Racine Avenue Chicago, IL 60607	M-F 382 trains/day at 55 mph	0
	Sat 338 trains/day at 55 mph	0
	Sun 356 trains/day at 55 mph	0

For Freight/Passenger and Insurance Information, please contact the CTA Representative, Mr. Marvin A. Watson (312) 681-3860

Basis of Payment: The costs for providing insurance, as noted above, will be paid for at the contract unit price per Lump Sum for RAILROAD PROTECTIVE LIABILITY INSURANCE.

APPROVAL OF INSURANCE: The ORIGINAL* and one CERTIFIED copy of each required policy shall be submitted to ENGINEER OF DESIGN, ILLINOIS DEPARTMENT OF TRANSPORTATION, 2300 SOUTH DIRKSEN PARKWAY, SPRINGFIELD, ILLINOIS 62764 for approval. The Contractor will be advised when the Department has received approval of the insurance from the railroad(s). Before any work begins on railroad right-of-way, the Contractor shall submit to the Resident Engineer evidence that the required railroad protective liability insurance has been approved by the railroad(s). The Contractor shall also provide the Resident Engineer with expiration date of each required policy.

*An additional original or required policy shall be submitted to the CTA.

MAINTAIN EXISTING LIGHTING SYSTEM

Description. This item consists of furnishing all labor, equipment, and incidental materials for maintaining existing City of Chicago street lighting systems until the proposed new equipment is installed, energized, tested, and accepted for operation by the Engineer.

The work shall include necessary temporary devices to maintain existing illumination. The location and protection devices necessary to comply with these requirements will be subject to the approval of the Engineer.

The work shall also include temporary wire or cable which may be required to be installed overhead between existing poles or temporary devices to maintain existing service until the proposed lighting equipment is installed, tested, and accepted for operation by the Engineer.

Coordination Requirements for Existing and Temporary Lighting with Other Contracts. The Contractor shall coordinate maintenance of existing and temporary lighting with the sequence of construction and maintenance of traffic for this project and IDOT Contract No. 62693 – Reconstruction of Frontage Roads, Retaining Walls, and Ramps Between 63rd Street and 59th Street.

The Contractor shall become familiar with the construction schedules and maintenance of traffic for Contract No. 62693. Work shall be coordinated between the Contracts such that none of the Contracts' schedules are delayed. Failure by the Contractor to coordinate with the other Contracts' construction schedule will be grounds for a deficiency deduction of \$500.00 for each and every occurrence, to be deducted from the next pay estimate due to the Contractor.

General Requirements. Perform work in accordance with Section 801 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

The Contractor shall MAINTAIN EXISTING LIGHTING SYSTEMS (temporary and permanent) and proposed lighting systems, including receptacles and other ancillary devices connected to the applicable street lighting controllers. Effective the day the Contractor is directed by the Engineer to assume responsibility for maintenance of the existing lighting system, the Contractor shall maintain the existing lighting equipment located within the project limits as it then exists.

Materials. Materials shall be according to the applicable Bureau of Electricity (BOE) Specifications and Articles of Standard Specifications Section 1000-Materials as noted elsewhere in these Specifications.

Maintenance Preconstruction Inspection. Before performing any excavation, removal, or installation work (electrical or otherwise) at the site, the Contractor shall request a maintenance preconstruction site inspection, to be held in the presence of the Engineer and a representative of the party or parties responsible for maintenance of any lighting and/or traffic control systems which may be affected by the work. The request for the maintenance preconstruction inspection shall be made no less than seven (7) calendar days prior to the desired inspection date. The maintenance preconstruction inspection shall:

Establish the procedures for formal transfer of maintenance responsibility required for the construction period, and establish the approximate location and operating condition of lighting and/or traffic control systems which may be affected by the work.

Marking of Existing Cable Systems. The party responsible for maintenance of any existing lighting and/or traffic control systems at the project site will, at the Contractor's request, mark and/or stake, once per location, all underground cable routes owned or maintained by the City. A project may involve multiple "locations" where separated electrical systems are involved (i.e. different controllers). The markings shall be taken to have a horizontal tolerance of at least one (1) foot to either side. The request for the cable locations and marking shall be made at the same time the request for the maintenance preconstruction inspection is made. The Contractor shall exercise extreme caution where existing buried cable runs are involved. The markings of existing systems are made strictly for assistance to the Contractor and does not relieve the Contractor of responsibility for the repair or replacement of any cable run damaged in the course of the work, as specified elsewhere herein. NOTE THAT THE CONTRACTOR WILL BE ENTITLED TO ONLY ONE REQUEST FOR LOCATION MARKING OF EXISTING SYSTEMS AND THAT MULTIPLE REQUESTS MAY ONLY BE HONORED AT THE CONTRACTOR'S EXPENSE. NO LOCATES WILL BE MADE AFTER MAINTENANCE IS TRANSFERRED, UNLESS IT IS AT THE CONTRACTOR'S EXPENSE.

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

Damage to Electrical Systems. Delete the last paragraph of Article 801.06 of the Standard Specifications.

Lighting Operation and Maintenance Responsibility. The scope of work includes the assumption of responsibility for the continuing operation of existing, temporary or other lighting systems and all appurtenances affected by the work as may be specified elsewhere herein. Existing lighting systems, when depicted on the plans, are intended only to indicate the general equipment installation of the systems involved and shall not be construed as an exact representation of the field conditions. It remains the Contractor's responsibility to visit the site to confirm and ascertain the exact extent of the electrical equipment and systems to be maintained. Where there is existing lighting within the project limits, prior to the start of activities at the site, the Contractor shall schedule a formal transfer of maintenance via the Engineer, however failure to do so does not relieve the Contractor of the maintenance responsibility specified herein and such failure obligates the Contractor to correct deficiencies in the existing system at his own expense.

Effective the date the Contractor's activities (electrical or otherwise) at the job site begin, the Contractor will be responsible for the proper operation and maintenance of all existing lighting systems which may be affected by the work for which maintenance has been transferred to the Contractor and all temporary and newly constructed lighting systems under this Contract, until final acceptance or as otherwise determined by the Engineer.

Except as specified herein, the Contractor's responsibility will include all applicable responsibilities of the City of Chicago, Department of Streets and Sanitation. These responsibilities will include lighting units (including underpass and navigational lighting), cable runs and lighting controls.

Electrical System Damage Response. The Contractor shall respond to damage calls for all system components being maintained and/or installed by the Contractor, existing and proposed, including, but not limited to pole knockdowns, circuit outages, more than 3 luminaires on a circuit, 3 successive luminaires, and controller outages within one hour after notification and provide immediate corrective action. The Contractor shall also repair other outages within 5 days. The Contractor shall maintain in stock a sufficient amount of material and equipment to provide temporary and permanent repairs. Any damage to the lighting system from any cause whatsoever shall be repaired or replaced in kind with equipment in the same condition before the incident or with new equipment provided by the Contractor at no additional cost to the Contract, all as approved by the Engineer. If the Contractor fails to respond so as to produce immediate corrective action within the specified time frames, or fails to complete repairs in a timely manner the Engineer may direct other forces, such as the City's Maintenance Contractor, to perform the work. Charges incurred will be direct billed to the Contractor. The City will retain all rights to pursue claims against third parties in all situations regardless of who is maintaining the system. The Contractor shall also provide the City with all accident and damage reports from any incidents.

Weekly Night-time Patrols. Responsibilities shall also include weekly night-time patrol of the lighting system, with patrol reports filed immediately with the Engineer and with deficiencies corrected within 24 hours of the patrol. Patrol reports shall be presented on standard forms as designated by the Engineer. Uncorrected deficiencies may be designated by the Engineer as necessitating emergency repairs as described elsewhere herein. Failure to submit patrol reports on a weekly basis will result in a Penalty for Non-Compliance as specified herein.

Contractor's Responsibility. Existing lighting systems which may be affected by the work will include, as a minimum, all existing lighting units within the project limits and these units may be temporarily isolated by means of in-line waterproof fuse holders as approved by the Engineer. When a controller is to be replaced or modified under the Contract work, or where otherwise indicated, the controller and all systems connected to it shall be included in the Contractor's responsibility for proper operation of lighting systems. The Contract Drawings may indicate the general extent of any existing lighting, but whether indicated or not, it remains the Contractor's responsibility to ascertain the extent of effort required for compliance with these specifications and failure to do so will not be justification for extra payment or reduced responsibilities.

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

Coordination Requirements for Existing and Temporary Lighting. The Contractor shall coordinate maintenance of existing, temporary, and proposed lighting with the sequence of construction and maintenance of traffic for this Project.

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

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

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

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

Deficiency Deduction for Non-Compliance. The Contractor will be subject to a penalty of \$500.00 per incident, per day, to be deducted from next pay estimate due Contractor, for each occurrence when the Engineer determines that Contractor or his Subcontractor is not in full compliance with this Item of the Specifications.

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

Reimbursement. If the Contractor utilizes any lighting equipment owned by the City or uses existing ComEd service, the Contractor shall compensate the City for such usage.

Method of Measurement. MAINTAIN EXISTING LIGHTING SYSTEM will not be measured for payment.

Basis of Payment. This Work will be paid for at the contract lump sum price for MAINTAIN EXISTING LIGHTING SYSTEM.
(CTE – 10/29/2004)

PVC CONDUIT IN TRENCH

Description. This item consists of furnishing and installing conduits, fittings, and accessories, laid in trench as specified herein, as shown on the plans, and as directed by the Engineer.

Materials. Rigid Nonmetallic Conduit shall conform to Standard Specifications, Article 1088.01(b) Polyvinylchloride (PVC) conduit shall conform to the requirements of National Electrical Manufacturers Association Standard, Publication Number TC2 for Schedule 40 and Schedule 80 conduit.

General Requirements. General requirements shall be in accordance with Section 801 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Location. Conduits will be installed at locations as shown diagrammatically on the plans. Conduits shall be installed in the shortest practicable line between points of termination, or under adverse conditions, as directed by the Engineer. Conduits not shown on the plans, but necessary for installation, will be paid for at the contract unit price as additional units of construction.

Installation. Installation shall be in accordance with Article 810.03(b) of the Standard Specifications, except for paragraphs (4) and (5), which is revised to read as follows:

- "(4) All conduit runs shall be cleaned and swabbed before installation of electric cables. Crushed, obstructed or deformed conduit will not be accepted. The excavation for trenched conduit under pavement shall be located at least 24 inches from the face of curb unless noted otherwise on the plans. All underground conduit shall have a minimum depth of 30 inches below grade.
- (5) When multiple conduits in a common trench are required, no more than three (3) 4 inch or smaller conduits shall be laid on a single, horizontal level. Four (4) or more conduits shall be installed on two (2) levels as directed by the Engineer."

Method of Measurement. Conduit in trench will be measured for payment in feet as installed and accepted, in place. Measurements will be made in straight lines along the centerline of the conduit, horizontally, between changes in direction. Vertical conduit and sweeps installed in foundations will not be measured for payment.

Basis of Payment. This Work will be paid for at the contract unit price per foot for PVC CONDUIT IN TRENCH, of the size and type specified. Excavation and backfill is not included in this item and will be paid separately.

(CTE – 10/15/2004)

INNERDUCT IN CONDUIT, 1 1/4 INCH

Description. This item consists of furnishing and installing innerduct in existing or proposed conduit for the eventual placement of fiber optic cable, as shown on the plans or as directed by the Engineer.

Material. Fiber optic innerduct shall be flexible plastic such as polyethylene with a minimum bending radius not less than the minimum bending radius of the fiber optic cable which it supports.

The innerduct shall be orange in color for ease of identification, and shall have a preinstalled pull rope or pull tape to facilitate cable pulling. Where used, innerduct shall not include pre-installed fiber optic cable. Fiber optic cable shall be installed in the innerduct after the innerduct is installed.

The innerduct shall meet, as a minimum, the following specifications:

Nominal Outside Diameter:	1.580"
Nominal Inside Diameter:	1.25"
Minimum Tensile Strength:	4000 lbs.
Minimum Impact Resistance:	25 lbs.
Minimum Crush Resistance:	900 lbs.
Maximum Pull Load:	1200 lbs.

The innerduct shall be ribbed longitudinally along the interior and exterior of the innerduct to minimize friction during cable installation and to prevent spiraling of the innerduct during installation in the conduit. The inside of the innerduct shall have a permanent coat of silicone or equivalent compound during manufacture to reduce friction during the installation of the cable.

Installation. The innerduct shall be pulled into the conduit per the manufacturer's instructions. The innerduct shall be used to protect and isolate the fiber optic cable. The cable shall be installed separately under a different pay item.

Innerduct shall not run continuous through manholes, handholes, or vaults; but shall be terminated at each wall of structures using methods recommended by the manufacturer.

Method of Measurement. The innerduct will be measured per foot installed, and will include only horizontal distances as shown on the plans, or as directed by the Engineer.

Basis of Payment. This Work will be paid for at the contract unit price per foot for INNERDUCT IN CONDUIT, 1 1/4 INCH.

(CTE – 10/15/2004)

ROD AND CLEAN DUCT IN EXISTING CONDUIT SYSTEM

Description. This item consists 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 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 shall be no differentiation in cost for the size of the conduit.

Construction Requirements.

Cleaning: Prior to starting construction, an inspection of all the existing manholes, will be made by the Engineer and the Contractor to determine the amount of existing debris in these structures. Upon completion of the work, the Contractor shall clean debris due to construction. Cleaning of existing manholes will be paid under a separate item.

Prior to removal of the duct rod a duct cleaning attachment such as a properly sized wire brush or cleaning mandrel shall be attached to the duct rod, which shall be pulled through the conduit to remove sand, grit, or other light obstructions from the duct to provide a clean, clear passage for the installation of cable.

Whenever the installation of cables is not performed as an adjunct to or immediately following the cleaning of the duct, a light weight pulling line such as a 1/8" polyethylene line or conduit measuring tape shall be placed and shall remain in the conduit to facilitate future work.

When great difficulty of either inserting the duct rod or removal of the cleaning mandrel is encountered, the duct may require further cleaning by use of a compressed air gun, or a low pressure water hose.

In the case of a broken duct line, the conduit shall be excavated and repaired as part of the item REPAIR AND REPLACE DAMAGED CONDUIT.

Method of Measurement. This Work will be measured in lineal feet for each conduit cleaned. Measurements shall be made from point to point horizontally. Vertical rises will not be measured.

Basis of Payment. This Work will be paid for at the contract unit price per lineal foot for ROD AND CLEAN DUCT IN EXISTING CONDUIT SYSTEM. When the number of cables to be installed require the use of more than one conduit in the same run, each additional conduit required shall be rodded and cleaned as a separate unit and paid for at the contract unit price.

(CTE – 10/15/2004)

REPAIR AND REPLACE DAMAGED CONDUIT

Description. This item consists of the repair and replacement of short segments of damaged or crushed conduit, needed to complete rewiring of a signalized intersection, as directed by the Engineer. Work shall include excavation of pavement or sidewalk, trenching, repair and replacement of the affected conduit using water-tight conduit splices, backfill of the trench, and restoration of disturbed pavement and sidewalk.

The costs of sidewalk removal and replacement work, pavement removal and replacement, and trench and backfill work, when incurred under this item, will not be measured for payment but shall be included in this item.

Before commencing repair and replacement, the Contractor shall submit a brief statement of the expected work method and effort for each section of damaged or crushed conduit to the Engineer. The actual work shall not take place until the Engineer approves the Contractor submittal.

Method of Measurement. The work paid for will be the number of lineal feet of conduit repaired, replaced, and accepted, measured in place. The length for measurement will be the distance horizontally between changes in direction of the conduit plus the conduit vertically attached to structure.

Basis of Payment. This Work will be paid for at the contract unit price per lineal foot for REPAIR AND REPLACE DAMAGED CONDUIT.

(CTE – 10/15/2004)

INTERCEPT EXISTING CONDUIT

Description. This item consists 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.

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

Construction Requirements. The Contractor shall 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) shall be carefully split so that all working cables are not interrupted. If conduit(s) are concrete encased, such concrete shall be removed as required. Any concrete encasement damaged during installation shall be restored as needed. No additional compensation shall be made for additional concrete. This item shall 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 shall furnish all materials for a complete installation.

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

Basis of Payment. This Work will be paid for at the contract unit price per each for INTERCEPT EXISTING CONDUIT. No additional payment will be allowed for excavation, backfilling, and restoration of a parkway.
(CTE – 10/15/2004)

JUNCTION BOX, POLE OR POST MOUNTED

Description. This item consists of furnishing and installing a Junction Box on each traffic signal post, traffic signal pole, or street light pole on which a signal head is mounted, as shown on the plans or directed by the Engineer.

General Requirements. Perform work in accordance with Sections 801, 802, and 813 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials. The Junction Box shall conform to the requirements of BOE Material Specification 1407 and shall be mounted above and attached by four (4) #10-24x3/4" stainless steel screws, to a long sweep elbow, Leitelt Brothers Company Item Number LB-16-64-A-2, or equivalent. A stainless steel, sign mounting, banding bracket, BOE Drawing No. 11984, shall be attached to the center of the back of the box with a 5/16" x 1" stainless steel machine screw. The box shall contain a 20 conductor terminal strip, Marathon Special Products Corporation Catalog Number 36002, or equivalent, securely fastened to an Aluminum Terminal Block "Z" Bracket, Leitelt Brother Company Item Number LB-16-6-4B, or equivalent, mounted with two Number 8-24 x 1/2" stainless steel machine screws in tapped holes in the mounting bosses, and located 3/4 inches from the right side facing the open box.

Installation. The junction box, 16" high, 6" Wide and 4" deep shall be installed with appurtenances as shown on BOE Standard Drawing 834 and as described herein. The box and elbow shall be mounted on the side of the pole away from the roadway. The center of the box shall be located approximately fifty-eight inches (58") above the adjacent sidewalk. The long sweep elbow shall be properly positioned over a hole 1 1/2" in diameter drilled in the pole approximately 48" above the sidewalk, for the installation of the cable. The hole shall 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. The box and elbows shall be banded to the pole with three (3) 3/4" stainless steel bands, one through the banding bracket and one each at the top and bottom of the elbow. The banding and clips shall have a baked-on black finish.

Color. Color shall be black as indicated on the plans. Color shall conform to City of Chicago Standards. A color sample will be submitted to the Engineer for approval prior to fabrication.

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

Basis of Payment. This Work will be paid for at the contract unit price per each for a JUNCTION BOX, POLE OR POST MOUNTED. Connection of cables and wires to the terminal strip will not be part of the cost of the junction box but are included in the installation of underground cable and the installation of signal heads.
(CTE – 10/15/2004)

DRILL EXISTING MANHOLE OR HANDHOLE

Description. This item consists of core drilling or opening a hole in an existing handhole or manhole for the installation of new conduit(s).

General Requirements. Perform work in accordance with Section 879 of the Standard Specifications, in accordance with ComEd Standards for ComEd handholes or manholes, Bureau of Electricity Standards, and the City of Chicago Electrical Code for City electric handholes or manholes, except as herein modified.

Materials. Rigid Steel Conduit: BOE Material Specification 1462.

Installation. The size of the hole shall be as close as possible to the size of the conduit. A conduit stub-out of the size required shall be installed in the drilled hole. A bushing shall be provided at the end of the conduit. The space between the conduit and the handhole or manhole shall be sealed with a waterproof grout. The type and orientation of the conduit shall be as shown on the plans.

If a brick manhole or handhole is found where core drilling is not possible, then the Contractor shall break a hole using low impact pneumatic hammers so as to not damage the remaining structure. Conduit openings in the wall shall be plugged with mortar. The mortar shall seal the conduit openings effectively and as directed by the Engineer, and shall be finished flush with the inner surfaces of the wall.

Coordination with ComEd for ComEd handholes or manholes, and coordination with the Bureau of Electricity for City electric handholes or manholes shall be performed by the Contractor prior to starting work.

Cleaning the existing manhole or handhole is not included in this item and will be paid for under a separate pay item.

Method of Measurement. Each hole that is drilled for a conduit, or hole that is made for a bank of conduits (drilling the hole, furnishing and installing the conduit(s) and bushing(s), including all necessary excavation and backfilling outside of the handhole or manhole) as indicated will be counted as a unit for payment.

Basis of Payment. This Work will be paid for at the contract unit price each for DRILL EXISTING MANHOLE OR HANDHOLE.
(CTE – 10/29/2004)

CLEAN EXISTING MANHOLE OR HANDHOLE

Description. This item consists of cleaning existing manholes or handholes for the installation of new conduit(s) and cable(s) or as directed by the Engineer.

General Requirements. Perform work in accordance with Section 801 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Installation. Relocate existing cable hooks and retrain existing cables as required prior to drilling the existing manhole or handhole. Remove any accumulation of silt, debris or foreign matter of any kind and dispose of off-site by the Contractor. Gas and water shall be pumped out. Water shall be filtered prior to discharge to a catch basin.

Coordination with ComEd for ComEd manholes or handholes, and coordination with the Bureau of Electricity for city electric manholes or handholes shall be performed by the Contractor prior to starting any work.

Drilling the existing manhole or handhole is not be included in this item and will be paid for under a separate pay item.

Method of Measurement. Each manhole or handhole that is cleaned will be counted as a unit for payment. Each manhole or handhole that is drilled will be measured for payment for cleaning only once.

Basis of Payment. This Work will be paid for at the contract unit price per each for CLEAN EXISTING MANHOLE OR HANDHOLE.

(CTE – 10/15/2004)

RACKING CABLES IN MANHOLE OR HANDHOLE

Description. This item consists of furnishing and installing racks and racking fiber optic cable in split duct and/or traffic signal and lighting copper cable around the inside perimeter of a manhole as shown on the plans and as directed by the Engineer.

In each manhole, the Contractor shall furnish and install at least four support brackets attached to the manhole walls, on which neatly coiled fiber optic cable in split innerduct and copper cable can be secured. The support brackets shall be attached firmly by screws drilled into the wall. Specific racking layout and components shall be provided in a submittal to the Engineer for each manhole, for review and approval in advance of installation.

In the event that a cable enclosure or other protective treatment of cable is used in place of racking on brackets at the direction of the Engineer, such alternate treatment shall be paid for as this item.

Method of Measurement. This Work will be measured on a per each basis each for manhole or handhole racked.

Basis of Payment. This Work will be paid for at the contract unit price per each for RACKING CABLES IN MANHOLE OR HANDHOLE.

(CTE – 10/25/2004)

TRENCH AND BACKFILL WITH SCREENINGS AND/OR SAND

Description. This item consists of excavating a trench for the installation of cables or conduits, and backfilling with limestone screenings or bank sand in paved areas as shown on the plans and or as directed by the Engineer.

General Requirements. Perform work in accordance with Section 801, 802, and 815 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials.

Underground Cable Marking Tape: Standard Specifications, Article 1066.06.

Backfill Material: Standard Specifications, Article 1003.04.

CONSTRUCTION REQUIREMENTS

Add the following to 815.03 item (a):

“The bottom of the trench shall be tamped, and the trench inspected by the Engineer before cable or conduit is placed in the trench.”

Delete paragraphs 1 through 4 of item (b) of 815.03 and insert as follows:

“Conduit and cable shall not be installed by plowing in lieu of trench and backfill. Conduit or cable installation performed by the plow method will not be measured for payment.”

Add the following to item (c) of 815.03:

“All trenches shall 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 Engineer is satisfactory backfilling material, may be used for backfilling above the layer of limestone screenings or sand. The limestone screenings or sand shall be used to fill the bottom of the trench to a depth of 12 inches above the top of the conduit or cable. Cinders, rocks, or other inappropriate materials will not be permitted to be used as backfilling material.”

Method of Measurement. This Work will be measured in feet along the centerline of the trench, with conduit or cable in place and will include all conduit in trench installations regardless of conduit size.

Basis of Payment. This Work will be paid for at the contract unit price per foot, for TRENCH AND BACKFILL WITH SCREENINGS AND/OR SAND.

The costs for horizontal boring and disposal of all surplus excavated material shall be included in the cost of trench and backfill.

Horizontal boring made for the purpose of placing conduit or cable under pavement, sidewalks, tree roots, or driveways will be paid for at the contract unit price per foot and designated as TRENCH AND BACKFILL WITH SCREENINGS AND/OR SAND.

(CTE – 10/28/2004)

TRENCH AND BACKFILL WITH SCREENINGS AND/OR SOIL

Description. This item consists of excavating a trench for the installation of cables or conduits, and backfilling with limestone screenings or soil in unpaved areas as shown on the plans and or as directed by the Engineer.

General Requirements. Perform work in accordance with Section 801, 802, and 815 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

CONSTRUCTION REQUIREMENTS

Add the following to 815.03 item (a):

“The bottom of the trench shall be tamped, and the trench inspected by the Engineer before cable or conduit is placed in the trench.”

Delete paragraphs 1 through 4 of item (b) of 815.03 and insert as follows:

“Conduit and cable shall not be installed by plowing in lieu of trench and backfill. Conduit or cable installation performed by the plow method will not be measured for payment.”

Add the following to item (c) of 815.03:

“All trenches shall 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 Engineer is satisfactory backfilling material, may be used for backfilling above the layer of limestone screenings or sand. The limestone screenings or sand shall be used to fill the bottom of the trench to a depth of 12 inches above the top of the conduit or cable. Cinders, rocks, or other inappropriate materials will not be permitted to be used as backfilling material.”

Method of Measurement. This Work will be measured in feet along the centerline of the trench, with conduit or cable in place and will include all conduit in trench installations regardless of conduit size.

Basis of Payment. This Work will be paid for at the contract unit price per foot, for TRENCH AND BACKFILL WITH SCREENINGS AND/OR SOIL.

The costs for horizontal boring and disposal of all surplus excavated material shall be included in the cost of trench and backfill.

Horizontal boring made for the purpose of placing conduit or cable under tree roots will be paid for at the same contract unit price per foot and designated as TRENCH AND BACKFILL WITH SCREENINGS AND/OR SOIL.

(CTE – 10/28/2004)

ELECTRIC CABLE IN CONDUIT

Description. This item consists of furnishing, installing and testing single conductor power cable, complete with all splicing, identifications and terminations as specified herein, as shown on the plans and as directed by the Engineer. The cable shall be installed in conduit.

General Requirements. Perform work in accordance with Sections 801 and 817 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials. Materials shall be according to the Bureau of Electricity (BOE) Material Specification 1440.

Installation. Install in accordance with Article 817.03 of the Standard Specifications, with the following additional requirements.

Cable Damage. All cable shall be installed with care to prevent damage to the cable. The Contractor shall check the cable for defects as it is being installed. Any defects found shall be

reported to the Engineer, and shall be repaired to the satisfaction of the Engineer, or the cable replaced as directed by the Engineer.

Cable Racks. Cable passing through manholes (or handholes) shall be trained around the sides of the manhole into a permanent position on racks mounted on each manhole wall. Before racking and training new cables, the Contractor shall rack and train all existing cables. Racking and training of existing cables is not to be included in this item but will be included under a separate pay item. Allowance shall be made for cable expansion and contraction. 10 feet of slack cable per set shall be provided in manholes or handholes for all new installations.

The Contractor is responsible for furnishing and installing cable racks and/or cable hooks for new and existing cables in all manholes and handholes as required to facilitate the cable installation. This Work will not be included in this item but will be included under separate pay items.

Color Coded. The cable installation shall 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 smallest conductor or equipment grounding conductor shall always be color coded green.

Street Lighting Controller. All cable pulled into the street lighting controller cabinets shall be properly trained and shall have sufficient slack provided for any rearrangement or future addition of equipment.

Testing. After a cable installation is completed, but before connections to apparatus are made, the insulation resistance of the cable shall be measured by means of an approved 600 Volt MEGOHM tester. The insulation resistance of any cable measured as specified shall be not less than five megohms.

Triplexing. When triplexed conductors are specified, the smaller of the conductors must have a green colored jacket and the triplexed conductors must be triplexed with a 16"-18" lay. The jacket color must not be unduly affected by cable installation or prolonged exposure to either direct sunlight or moisture.

Cable Terminations or Splices. Where approved, shall be made in accordance with Article 1066.06. All connectors, insulating tapes and related materials shall be approved by the Engineer. Splices and terminations shall be included in the installation of cable. Separate payment will not be made.

Cleaning. When all cable installation has been completed in a manhole or handhole, the manhole or handhole shall be cleared of all debris and left in broom clean condition.

Method of Measurement. The cable will be measured for payment in feet in place. Measurements will be made horizontally, in straight lines between changes in direction and to the centers of equipment and box access points.

Vertical cable will be measured for payment. The vertical distance required for breakaway devices, foundations, concrete pedestals, etc., and the depth of any burial will be measured. Changes in direction will assume perfect straight line runs, ignoring actual raceway sweeps.

Measurements will not include waste ends of cable which may have to be cut off for making splices or connections to any material or apparatus. Ten feet of slack will be allowed where terminating cable at a lighting controller, or where routing cable through a manhole or handhole. Three feet of slack per set will be allowed at light poles, pull boxes, junction boxes, and similar locations.

Basis of Payment. This Work will be paid for at the contract unit price per foot for ELECTRIC CABLE IN CONDUIT or TRIPLEXED CABLE IN CONDUIT, of the size specified.
(CTE – 10/28/2004)

AERIAL CABLE REMOVAL

Description. This item consists of disconnecting and removing aerial cable with messenger wire where poles will remain as shown on the plans and as directed by the Engineer. The removal shall include removal of all mounting hardware, associated apparatus, and connections to the associated lighting controller, electric service pole or the last connection unaffected by the removal work.

Removal work will not be permitted without approval from the Engineer. Material removed as part of this item shall become the property of the Contractor and shall be removed from the site.

Method of Measurement. The removed aerial cable will be measured in feet in place and will be taken as the length of the messenger wire. Measurement will be made in a straight line between changes in direction and to the centers of poles and control cabinets. Sag of the aerial cable or vertical cable will not be measured for payment.

Basis of Payment. This Work will be paid for at the contract unit price per foot for AERIAL CABLE REMOVAL.

(CTE – 10/15/2004)

AERIAL CABLE WITH MESSENGER WIRE

Description. This item consists of furnishing, installing, and connecting aerial cable complete with all splicing, identifications, terminations, and secondary racks.

General Requirements. Perform work in accordance with Section 801, 802, and 818 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Furnish and install Secondary Racks per BOE Material Specification 1443 and as shown on the plans.

Where existing cable is to be abandoned in place, it shall be disconnected and reconnected to new aerial cable.

Method of Measurement. Secondary Racks will not be measured for payment and are included in the cost of this item.

Used cable will not be measured for payment and is included in the cost of this item.

The cost of disconnecting and abandoning in place existing cables feeding street, roadway, and underpass lighting, and reconnecting to the temporary lighting system will not be measured for payment and is included in the contract unit price for this item.

Basis of Payment. This Work will be paid for at the contract unit price per foot for AERIAL CABLE, WITH MESSENGER WIRE of the type, size, and number of conductors indicated.

(CTE – 11/03/2004)

GROUND ROD, 3/4" DIA. X 10.0'-0" LENGTH

Description. This item consists of furnishing, installing, and connecting ground rods for the grounding of service neutral conductors and for supplementing the equipment grounding system via connections at lighting units, manholes, handholes, street lighting controllers, and traffic signal controllers throughout the system.

General Requirements. Perform work in accordance with Sections 801, 806 and 807 of the Standard Specifications, Bureau of Electricity Standards, the City of Chicago Electrical Code, and Article 250 of the NEC, except as herein modified.

Materials.

Copper Ground Wire: BOE Specification No. 1440.

Ground Rod: BOE Specification No. 1465 and Standard Specifications, Article 1087.01.

Installation. Ground rods shall be driven so that the tops of the rod are 24 inches below finished grade, unless noted otherwise on the plans. Where indicated, ground rods shall be installed through concrete foundations or manholes. Where ground conditions, such as rock, preclude the installation of the ground rod, the ground rod may be deleted with the prior approval of the Engineer.

Ground rod connection shall be made by approved clamps. Ground wire for connection to foundation steel, or as otherwise indicated, shall be stranded uncoated bare copper, in accordance with the applicable requirements of ASTM Designation B-3 and ASTM Designation B-8 and shall be included in this item. Unless otherwise indicated, the wire shall not be less than No. 8 AWG.

The ground wire shall be interconnected to the ground rod, reinforcing steel and anchor bolts at each foundation. All connections to ground rods, structural steel and anchor bolts shall be made with approved clamp. Where such connections are made to insulated conductors, the connection shall be wrapped with at least 4 layers of electrical tape extended 6 inches onto the conductor insulation.

Method of Measurement. Ground rods will be counted per each in place. Ground wires and connection of ground rods at lighting units, manholes, handholes, controller foundations, and wall mounted controllers will not be measured for payment and are included in this pay item.

Basis of Payment. This Work will be paid for at the contract unit price each for GROUND ROD, of the diameter and length indicated.

(CTE – 10/28/2004)

CONDUIT IN TRENCH, GALVANIZED STEEL

Description. This item consists of furnishing and installing conduits, fittings, and accessories, laid in trench as shown on the plans and as directed by the Engineer. This item does not include excavation or backfill of the trench.

General Requirements. Perform work in accordance with Sections 801 and 810 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials. Rigid Steel Conduit shall conform to BOE Material Specification 1462.

Conduits will be installed at locations as shown diagrammatically on the Plans. Conduits shall be installed in the shortest practicable line between points of termination, or under adverse conditions, as directed by the Engineer. Conduits not shown on the Plans, but necessary for installation, will be paid for at the applicable bid unit price as additional units of construction.

Installation. Installation shall be in accordance with Article 810.03(a) of the Standard Specifications, except for paragraph (2), which is revised to read as follows:

- "(2) The excavation for trenched conduit under pavement shall be located at least 24 inches from the face of curb unless noted otherwise on the Plans. All underground conduit shall have a minimum depth of 30 inches below grade.

When multiple conduits in a common trench are required, no more than three (3) 4 inch or smaller conduits shall be laid on a single, horizontal level. Four (4) or more conduits shall be installed on two (2) levels as directed by the Engineer.

Conduits transitioning from trench to bridge abutments shall be securely attached to the retaining wall by means of galvanized clamps and clamp backs held in place by anchor bolts. Conduits shall be fastened as close to the underside of the abutment as possible, and securing clamps shall be installed every 5 feet. Conduits shall be continuous through party walls."

Method of Measurement. Conduit in trench will be measured according to Section 810 of the Standard Specifications.

Basis of Payment. This Work will be paid for at the contract unit price per foot for CONDUIT IN TRENCH, of the size specified, GALVANIZED STEEL. Excavation, including but not limited to trench and backfill, will not be included in this item and will be paid for separately.

(CTE – 10/28/2004)

MAST ARM, STEEL LIGHTING, 12 FT.

Description. This item consists of furnishing and installing a steel pipe, truss type mast arm of a specified length complete with pole plates and mounting hardware to support a roadway lighting luminaire as shown on the plans or as designated by the Engineer. Color shall be satin black.

Materials.

Mast Arm (12 ft.): BOE Material Specification 1450 and Standard Drawing 839.
Pole Plate: BOE Standard Drawing 659.

The pole plates shall be welded to a curved piece of A36 steel, which shall be able to accommodate two 5/8" steel bands; one top; one bottom. A hole shall be drilled in the steel to accommodate wire. The hole shall be smooth and free from burrs.

General Requirements. Perform work in accordance with Section 801 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Submittal Information. The Contractor shall provide complete product information to the Engineer and City personnel according to the above BOE specifications. The cost to obtain and submit this information is included in this item and separate payment will not be made.

Factory Inspection and Testing. The Contractor shall make provisions for factory inspection and testing of the mast arms by City personnel and City representatives according to BOE Specification 1450. Certified, independent paint inspection and testing shall also be performed as directed by the Engineer. The cost of these provisions shall be included in this item and separate payment will not be made. Inspection and testing shall be successfully completed prior to shipping the units.

Installation. The mast arm shall be installed with two bolts to the mast arm attachment. The pole shall have a one inch diameter hole drilled for cable at the location shown on the plans, or as directed by the Engineer. The mast arm attachment shall be banded to the pole at the height and location shown on the plans or as directed by the Engineer. The banding shall be 5/8" stainless steel. No mast arm will be installed until it is approved by the Engineer.

Mast arm shall not be installed without the appropriate luminaire. The luminaire is not included in this item and will be paid for under a separate pay item.

Method of Measurement. Each mast arm (complete with mounting hardware, mast arm attachments, appurtenances, and any required drilling or modification of the pole) that is furnished and installed as indicated will be counted as a unit for payment.

Basis of Payment. This work will be paid for at the contract unit price per each for a MAST ARM, STEEL LIGHTING, 12 FT., which will include all work as described herein.

(CTE – 11/04/2004)

CONCRETE FOUNDATION, STREET LIGHTING CONTROLLER

Description. This item consists of furnishing and installing concrete foundations at the locations shown on the plans or as directed by the Engineer. Work includes drilling of foundation shaft, furnishing and installing assemblies of steel reinforcing bars, anchor bolt assemblies and electrical conduit and bushings; swabbing and clearing the electrical conduits; and furnishing, placing and finishing concrete foundations.

General Requirements. Perform work in accordance with Section 836 of the Standard Specifications, Bureau of Electricity Standard, and City of Chicago Electrical Code, except as herein modified.

Materials. The concrete foundation shall meet the requirements of Bureau of Electricity (BOE) Drawing No. 880.

Conduit size and material shall be according to the plans.

Anchor bolt assemblies shall be in accordance with BOE Standard Drawing No. 811. Anchor bolts shall be fabricated from steel meeting the requirements of ASTMA400. Nuts shall be fabricated in accordance with ASTMA563. Washers shall be fabricated in accordance with ASTM F436. Anchor bolt diameter and length shall be as noted on the Plans. Anchor bolt assemblies shall include anchor bolts, nuts, and washers. All hardware shall be hot-dipped galvanized in accordance with ASTMA153.

Concrete shall be Class SI Concrete according to Section 1020 of the Standard Specifications.

Installation. Installation shall be in accordance with Article 836.03 of the Standard Specifications, except for paragraph (c), which is revised to read as follows:

"(c) Construction Requirements: The foundation shall be 20 inches in diameter, with a 15 inch bolt circle and four (4) identical anchor bolts. The top 15 inches of the foundation shall be square. Top of foundation shall be set at an elevation of 12 inches above grade unless noted otherwise on the Plans, and shall be finished smooth and level to allow proper mounting of an equipment enclosure. The foundation shall be centered back from the edge of pavement in accordance with dimensions as shown in the Plans. Depth of foundation shall be as shown on BOE Drawing No. 880. All concrete finishing work shall be accomplished by an experienced concrete finisher with approximately five (5) years experience and shall be approved by the Engineer prior to commencement of concreting operations. The cost of furnishing and installing all concrete and anchor bolts for the foundation shall be included in this Item."

Sawcutting. In locations where the foundation is installed in a paved area, the Contractor shall sawcut that portion of the pavement to be removed to facilitate installation of the equipment enclosure foundation. If the existing pavement is removed or damaged outside the required removal limits, the Contractor shall repair that portion at no additional expense to the satisfaction of the Engineer. The cost of sawcutting will be paid for under this Item.

Anchor Bolts. Anchor bolts shall be set in accordance with dimensions shown in the plans so that when an equipment enclosure is mounted on the foundation, the door shall be properly oriented as indicated in the plans. The anchor bolts shall be set by means of a metal template, which shall be submitted for approval before any foundation work is begun. The template shall hold the bolts plumb, and in proper position during the pour, and shall serve as a form for the top 6 inches of the foundation. Anchor bolts shall project 5 inches above top of foundation. The cost of furnishing and installing anchor bolt assemblies and template will be included in this Item.

Conduits. Foundation conduits shall be large radius, prefabricated elbows of a quantity, size and type as specified in the plans. The elbow ends above ground shall extend to an elevation even with the top of the anchor bolts, shall be centered within the foundation, and shall be fitted with approved conduit bushings prior to the installation of cables. The cost of furnishing and installing conduit stub-ups complete with bushings will be included in this Item.

Method of Measurement. Each equipment enclosure foundation furnished and installed complete according to the requirements of the specification will be counted as a unit for payment.

Basis of Payment. This Work will be paid for at the contract unit price per each CONCRETE FOUNDATION, STREET LIGHTING CONTROLLER.
(CTE – 10/28/2004)

ELECTRICAL MANHOLE 3'X4'X4' WITH 24" FRAME AND LID

Description. This item consists of furnishing the materials for and constructing a standard City of Chicago electrical manhole as specified herein, as shown on the plans and as directed by the Engineer.

General Requirements. Perform work in accordance with Section 801 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials.

General: Materials must be in accordance with Bureau of Electricity (BOE) Standard Drawing No. 730.

Frame and Cover. The manhole frame and cover must be fabricated from cast iron conforming to the requirements of BOE Standard Drawing No. 872.

Pulling Iron. The pulling iron must be fabricated in accordance with BOE Standard Drawing No. 7878.

Grate for Sump. The grate for sump must be fabricated in accordance with the requirements of BOE Standard Drawing No. 10792.

Installation. Installation must be in accordance with BOE Standard Drawing No. 730, and Standard Specifications Article 814.03 except for the following paragraph to be added to read:

"(e) French Drain. The french drain must be constructed in accordance with Article 601.06."

The manhole must be a cast-in-place concrete structure or precast reinforced concrete structure, complete with frame and cover, as approved by the Engineer. The number and orientation of conduit openings must be as shown on the plans.

The frame casting must be accurately set on a full collar of sewer brick and mortar to the finished elevation such that no subsequent adjustment is necessary. Mortar must be mixed in a proportion of one (1) part cement to three (3) parts sand by volume of dry materials.

Conduit openings in the manhole wall must be plugged with mortar after entering conduit laterals have been installed in place in the manhole. The mortar must seal the conduit openings effectively and as directed by the Engineer, and must be finished flush with the inner surfaces of the manhole wall. Mortar must be in accordance with Standard Specifications Article 1025.02.

Hooks and/or cable racks, for racking and training of cables, will not be included in this item and will be paid for under a separate pay item.

Ground rod(s) will be included in this item and will not be paid for separately.

Method of Measurement. Each electrical manhole (excavation, concrete, reinforcing rods, frame and cover, french drain, and appurtenant equipment) that is constructed and installed as indicated will be counted as a unit for payment.

Basis of Payment. This Work will be paid for at the contract unit price each for ELECTRICAL MANHOLE, 3' X 4' X 4' WITH 24" FRAME AND LID.

(CTE – 10/28/2004)

CABINET WORK, SPLICING, TESTING AND MISC.

Description. This item consists of furnishing, installing, and testing fiber optic cable splice and splice enclosures, optical connectors, single mode/multimode convertors, pigtails and patch panels, hardware, and software as required for a fully operational communication system that provides all the features and functions identified herein and shown on the plans.

General Requirements. Perform work in accordance with Section 802 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code.

The interconnect communications system shall accommodate present and future data, voice and video transmission requirements for the City of Chicago. The communications layout is shown in the plans.

Materials.

Optical Splice/Splice Enclosure:

1. All permanent optical splices shall be of the fusion type.

A factory fabricated fusion splice kit containing materials necessary for quality fusion splicing shall be used for each fiber splice.

Splices made with the factory fabricated single mode fusion splice kit shall be capable of achieving not more than 0.1 dB loss at 1310 nm.

Splices made with the factory fabricated multimode fusion splice kit shall be capable of achieving not more than 0.1 dB loss at 850 nm.

An emergency restoration kit shall be provided to perform temporary splices. This kit shall include all necessary tools and materials to perform mechanical splices. Each mechanical splice kit shall be capable of achieving not more than 0.5 dB loss at any wavelength.

2. The outdoor optical splice enclosure shall be capable of aerial, duct, or buried applications.

The splice enclosure shall consist of an outer enclosure, an inner enclosure, and splice trays.

The splice enclosure shall be suitable for application in the temperature range of -40°C to $+70^{\circ}\text{C}$.

The splice enclosure shall provide space allowing entry of fiber optic cable without exceeding the minimum bend radius of the cable.

The splice enclosure shall be capable of through, branch, or mid-span type splice locations.

The splice enclosure shall be designed to permit selective fiber splicing (looping an interconnect cable in and out while only cutting into the desired fibers).

The splice enclosure shall allow splicing of all fibers up to the maximum number specified on the plans.

The outer enclosure shall be waterproof and re-enterable and shall utilize an encapsulant between the inner and outer enclosure to prevent the ingress of moisture.

The Contractor shall furnish and install splices and splice enclosures adjacent to the cabinets at the locations indicated on the plans and as specified herein.

Fiber Patch Panel:

Fiber Patch Panels (FPPs) shall be furnished and installed at the locations shown on the plans.

The optical patch panel shall terminate outside plant fiber pigtails. The FPP shall allow termination of a fiber patchcord to interconnect outside plant fibers to optical modems.

The approved type optical connectors on the end of each pigtail shall screw into a sleeve securely mounted to a patch panel within the controller cabinet. The maximum optical loss across the connection shall not exceed 0.25 dB.

The FPP shall be a surface mount panel as per BOE Drawing No. 909.

Optical Patch Cords And Pigtails:

Optical patch cords shall consist of a section of single fiber jacketed cable equipped with optical connectors at both ends. Patch cords for connections from FPPs to optical devices or other patch panels shall be equipped with factory installed connectors on both ends.

The optical pigtail shall consist of multiple fibers, factory connectorized on one end, suitable for installation in an outdoor duct run. Each fiber shall be individually jacketed, with aramid yarn fibers between the fiber and the subjacket. The fibers shall then be contained in a medium density polyethylene outer jacket. The multi-fiber pigtail shall be provided with eight (8) or twelve (12) multimode fibers or eight (8) single-mode fibers as required for the particular application. The hybrid fiber pigtail shall consist of eight (8) singlemode fibers and eight (8) multimode fibers.

The factory installed connectors furnished as part of optical patch cords and pigtails shall meet or exceed the requirements for approval of connectors specified herein.

The fiber portion of each patch cord and pigtail shall be a single, jacketed fiber with optical properties identical to the optical cable furnished under this Contract.

The cable shall be suitable for installation in outdoor manholes with water and/or ice.

Each jacketed fiber shall have a tensile strength in excess of 50 lbs.

Optical Connectors:

All permanent connector installations at traffic signal controller cabinets shall utilize factory installed and tested connectors on pigtails. Field installed connectors shall be allowed only at the indoor termination for connection to fiber optic modems.

The optical connectors furnished shall be uniform throughout this Contract. In the event that different types of connectors are necessary for the classification of modems supplied, a plan shall be submitted to the Engineer for approval for the use of one type of connector (for each fiber type) universally.

All single-mode connectors on equipment, patchcords, pigtails or panels shall be SC type or approved equivalent.

All multimode connectors on equipment, patchcords, pigtails or panels shall be ST compatible or approved equivalent.

The connectors shall meet, as a minimum, the following specifications:

Attenuation	≤0.4 dB
Tensile Strength	10 lbs. (Single fiber cable w/ strength member)
Durability	less than 0.3 dB change
Temperature Cycling	-40°C to +75°C, 40 cycles
Return Loss	Greater than 40 dB
Fiber Diameter	125 μm O.D., nominal

Installation.

The fiber optic cable shall be brought into each FPP as follows:

Fiber Optic Cable (Single Mode, Multi-Mode and Hybrid): The hybrid cable shall be brought into the manhole adjacent to each controller cabinet as shown on the plans, and fifty feet (50') of cable slack shall be coiled in the manhole.

The fibers of the hybrid cable shall be spliced in the manhole as shown on the plans. A factory connectorized, multi-strand, jacketed pigtail shall be fusion spliced to the active fibers in the cable for the respective cabinet. The remaining fibers in the cable shall not be cut and shall pass through the manhole. The pigtail shall be installed in conduit from the splice enclosure to the controller cabinet, unless otherwise noted, and shall be terminated on the fiber patch panel.

The fiber pigtail shall terminate in the controller cabinet within a fiber patch panel (FPP). The size of the FPP shall be sufficient to accommodate all fibers and connectors from the fiber pigtail. The location of the FPP shall not restrict access to other controller components. The fiber pigtail shall be firmly secured to the FPP using the manufacturer's recommended procedures or as directed by the Engineer.

Testing.

Testing of fiber optic cable shall be as follows:

1. **Manufacturer's Factory Tests.** The Contractor shall furnish data showing that each finished and installed fiber optic cable segment is traceable to the test data on file for each step in its manufacturing process.

The Engineer will make inspections and tests as are necessary to determine if the cable meets the requirements of this Special Provision. The Engineer will have the right to reject cable which is defective in any respect.

The Engineer will be given ten (10) working days, advance notice of the date the cable will be ready for final testing so that the Engineer may be present at the tests.

Physical tests shall be made on samples selected at random at the place of production. Each test sample shall be taken from the accessible end of different reels. Each reel selected and the corresponding sample shall be identified. The number and lengths of samples shall be specified for the individual test. All applicable tests for the cable materials and cable construction specified shall be performed.

Optical tests shall be made on the entire length of each continuous fiber provided within each fiber optic cable. Each test shall be completed during manufacture as required, and again prior to shipping, after the cable is secured to the reel in final shipping packaged form.

The manufacturer shall provide, at the point of production, apparatus and labor for making any or all of the following tests under the supervision of the Engineer, to include, but not be limited to:

Tensile Strength
Impact Resistance, Crushing, and Flexing
Optical Attenuation
Optical Spectral Dispersion
Optical Time Domain Reflectometry (OTDR)

2. Installed Field Tests. Testing of installed fiber optic cable shall be performed after complete installation and termination of the cables.

The Contractor shall notify the Engineer in writing five (5) working days in advance of the testing of the cable so that the Engineer, or his/her representative, may be present for the tests, if the Engineer so elects.

Optical testing shall be performed on all fibers within each cable, including those extra fibers which the Contractor elects to include above those invoiced, in order to meet the 100 percent fiber quality warranty.

Testing shall be performed on the fibers, as terminated on the FDPs or FPPs.

All necessary test equipment shall be provided by the Contractor to perform tests to include, but not be limited to, the following:

- a) Optical attenuation at 1310 and 1500 nm for single mode fibers and 850 nm and 1300 nm for the multimode fibers.
- b) Optical Time Domain Reflectometer (OTDR) records (labeled and identified), either photographic or computer printer/plotter output. Test shall be conducted for both directions of transmission. All OTDR tests shall be made with an OTDR approved by the Engineer.

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

Basis of Payment. This Work will be paid for at the contract unit price per each for CABINET WORK, SPLICING, TESTING, AND MISC.

(CTE – 10/25/2004)

MAINTENANCE OF EXISTING TRAFFIC SIGNAL INSTALLATION

Description. The Contractor shall maintain the existing traffic signal system at each intersection in this contract, as described in the Special Provision “Operation of Traffic Signals”, which is a section of this specification. The maintenance shall commence at a time after contract award that is mutually agreed upon by the Contractor, the City, and the State. Maintenance shall continue in force until the expiration of the time allotted for the project, or until new signals are accepted by the City, whichever comes first. If signal installation is not completed and accepted within the time allotted for the project, the signals shall be maintained by the Contractor at no additional cost to the City.

A properly operating traffic signal system shall be maintained by the Contractor at each intersection in the contract until such date as the new traffic signal system shall be accepted for operation and maintenance by the City. The acceptance conditions are noted in the Special Provision “Traffic Signal Turn On”, which is a section of this specification, and which date shall constitute the cut-off date for maintenance of signals at a specified intersection.

General Requirements. The Contractor shall follow the procedures as specified in Sections 800, 850, and 1086 of Standard Specifications, Bureau of Electricity standards and the City of Chicago Electrical Code, except as herein modified.

Maintenance Procedure. The Contractor shall perform the following maintenance program.

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

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

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

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

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

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

Method of Measurement. Maintenance of Existing Traffic Signal Installation will not be measured for payment.

Basis of Payment. This work will be paid for at the contract lump sum price for MAINTENANCE OF EXISTING TRAFFIC SIGNAL INSTALLATION, which shall be payment in full for the work described herein.

(CTE – 09/17/2004)

TEMPORARY TRAFFIC SIGNAL INSTALLATION

Description. This Work consists of furnishing, installing, maintaining, and removing temporary aerial wiring on existing poles or temporary wood poles to maintain continuous traffic signal operation while other intersection work is completed. This Work will also include any required temporary traffic signal equipment, materials, connections, temporary relocation and wiring of traffic signal heads or pedestrian signal heads to adjacent poles to maintain visibility and continuous traffic signal operation during construction.

Materials and Installation. The Contractor shall select an aerial wiring scheme based on the specific requirements of each intersection. The Contractor may use multi-conductor self-supporting cable or cable requiring messenger wire of sufficient voltage and rating to handle the intersection electrical requirements as approved by the Engineer and Bureau of Electricity. The

Contractor shall submit a sketch of the proposed wiring scheme (wire location, type of cable) to the Engineer and the Bureau of Electricity for approval prior to installation.

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

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

The Contractor shall maintain the existing traffic signal system at each intersection in this Contract, as described in the SPECIAL PROVISION OPERATION OF TRAFFIC SIGNALS, which is a section of these specifications. The maintenance shall commence at the time during construction, when the Contractor in the course of his Work begins construction at the intersection. Maintenance shall continue in force until the expiration of the time allotted for the project, or until the new signals are accepted by the sponsoring agency, whichever comes first. If signal installation is not completed and accepted within time allotted for the project, signals shall be maintained by the Contractor at no additional cost to the sponsoring agency. A properly operating traffic signal system shall be maintained by the Contractor at each intersection in the Contract until such date as the new traffic signal system will be accepted for operation and maintenance by the sponsoring agency at the direction of the Engineer. The acceptance conditions are noted in the SPECIAL PROVISION, TRAFFIC SIGNAL TURN ON, which is a section of these specifications, and which date shall constitute the cut-off date for maintenance of signals at a specified intersection.

General Requirements. Perform Work under this item in accordance with Sections 800, 801, 850 and 1086 of the Standard Specifications, Bureau of Electricity Standards and the City of Chicago Electrical Code, except as herein modified.

Maintenance Procedure. The Contractor shall perform the following maintenance program.

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

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

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

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

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

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

Special Provision Operation of Traffic Signals.

Existing traffic control signal installations and/or any electrical facilities at certain intersections included in this Section may be altered or reconstructed totally or partially as part of the Work on this Section. The Contractor is hereby advised that all traffic control equipment, presently installed at these locations, is the property of the City of Chicago.

The Contractor is further advised that the existing traffic signals, or the existing temporary installation, shall remain in operation during all construction stages except for the most essential down time. Any shutdown of the installation, for a period to exceed fifteen (15) minutes, shall have the prior approval of the Engineer. Such approval will generally only be granted during the period extending from 10:00 a.m. to 3:00 p.m. on weekdays. Any other traffic signal shutdown, either for periods in excess of one (1) hour or outside of the 10:00 a.m. to 3:00 p.m. weekday period shall have prior approval of the Engineer.

The Contractor, prior to the commencement of his Work, shall notify the City of Chicago of his intent to perform his Work. Upon request from the Contractor, the City of Chicago will locate any buried conduit or other electrical facility which may interfere with the Contractor's operations without charge to him. This will in no way relieve the Contractor's responsibility to repair and/or replace electrical facilities damaged by his operations.

Any known or suspected damage to the electrical facility shall be reported immediately to the Engineer. The Contractor will be held fully responsible for the repair and/or temporary, if, in sole opinion of the Engineer, such damage was caused by the negligence of the Contractor, his agents, or employees.

No part of this Special Provision shall be construed as exempting the Contractor from his duty to follow careful construction practices, including all standard provisions in the Standard Specifications for Road and Bridge Construction.

The intent of this Special Provision is to prescribe a procedure wherein a Contractor may obtain formal approval of a traffic signal installation at a given intersection, and a release from maintenance responsibility for the new materials installed, in order to be permitted to disconnect and remove the old traffic signal equipment.

When the road is open to traffic, except under conditions where existing traffic signals are being maintained or when a temporary traffic signal installation has been installed, the Contractor may request a turn-on and inspection of the completed traffic signal installation at each separate location. This request shall be made to the Bureau of Electricity, a minimum of three (3) working days prior to the time of the requested inspection. Upon demonstration that the signals are operating and all Work is completed in accordance with the Contract and to the satisfaction of the Engineer, the Bureau of Electricity's Inspector will then allow the signals to be placed into continuous operation. The Agency that is responsible for the maintenance of each traffic signal installation will assume the maintenance upon successful completion of this inspection.

Special Provision Traffic Signal, Turn On.

The intent of this Special Provision is to prescribe a procedure wherein a Contractor may obtain formal approval of a traffic signal installation at a given intersection, and a release from maintenance responsibility for the new materials installed, in order to be permitted to disconnect and remove the old traffic signal equipment.

When the road is open to traffic, except under conditions where existing traffic signals are being maintained or when a temporary traffic signal installation has been installed, the Contractor may request a turn-on and inspection of the completed traffic signal installation at each separate location. This request shall be made to the Bureau of Electricity, a minimum of three (3) working days prior to the time of the requested inspection. Upon demonstration that the signals are operating and all Work is completed in accordance with the Contract and to the satisfaction of the Engineer, the Bureau of Electricity's Inspector will then allow the signals to be placed into continuous operation. The Agency that is responsible for the maintenance of each traffic signal installation will assume the maintenance upon successful completion of this inspection.

Method of Measurement. Each temporary traffic signal installation that is installed and removed as indicated will be counted as a unit for payment. Weekly maintenance for temporary traffic signal installations will not be measured for payment. Each intersection installation will be measured for payment as one unit.

Basis of Payment. This Work will be paid for at the Contract Unit Price per each TEMPORARY TRAFFIC SIGNAL INSTALLATION, which will be payment in full for the material and work described herein. Each intersection installation will be paid for separately.

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

(CTE – 11/04/2004)

SERVICE INSTALLATION 200 AMP

Description. This item consists of furnishing and installing a service on a Commonwealth Edison Company wood pole for a 120/240 volt street lighting service installation per BOE Drawing Number 11925.

The 200 ampere installation can be used for either a 120 volt or 240 volt service.

Service Junction Cabinet. The cabinet shall be cast from corrosion resistant metal, subject to approval. Its dimensions shall not exceed 8 inches in width, 18 inches in height and 9 inches in depth, and it shall be weather proof. It shall contain a two (2) pole disconnecting device, such as Milbank Manufacturing Company 200 ampere size test block, Number 420, with bridge contacts and barrier strip, subject to approval. A suitable ground lug, subject to approval, to accommodate a 1/C No. 2/0 AWG stranded copper conductor shall be provided. The completed cabinet shall be as shown on City of Chicago Drawings Numbered 11922 and 11925.

Cable Grip. A 1-1/4 inch cable grip fitting shall be installed at top of cabinet to accommodate a 3/C No. 2/0 AWG service cable. Fitting shall be Pyle National Company Number DB-131, or an approved equal.

Service Riser. A 2-inch diameter galvanized rigid steel conduit riser terminated at the bottom with a galvanized rigid steel, large radius, conduit elbow shall be installed by the Contractor on the Commonwealth Edison Company service pole as shown on BOE Drawing Number 11925. The top of the riser shall terminate in the service junction cabinet and the end of the elbow shall connect to the horizontal conduit lateral leading to the control cabinet. Payment for the riser, elbow and attachments shall be included in the price bid for the complete Commonwealth Edison Company pole service junction unit.

Cable. A sufficient length of three (3) conductor service entrance cable shall 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 cables shall meet the requirements of Bureau of Electricity Specification No. 1457, or an approved equal, and shall be No. 2/0 AWG. The black and red conductors shall be connected to the disconnect device and the white conductor to the ground lug, for the 240 volt street lighting service installation.

Cables in Service Riser. Cables shall extend continuously from the load side of the disconnect device, down the riser and elbow, and in the conduit lateral to the load as indicated on the plans. Payment for cables in riser and elbow will be included in the bid price.

Basis of Payment. This Work will be paid for at the contract unit price per each for SERVICE INSTALLATION 200 AMP. Any charges by the utility company to provide electrical service to the service installation shall be paid for by the Contractor.

(CTE – 10/15/2004)

LUMINAIRE, STREET LIGHTING, HIGH PRESSURE SODIUM VAPOR

Description. This item consists of furnishing and installing a luminaire complete with lamp, internal ballast, fuses, and electrical components, mounting hardware, and appurtenances for installation as shown on the plans, as specified herein, and as directed by the Engineer.

General Requirements. Perform work in accordance with Sections 801 and 821 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials.

Luminaire (310 watt): BOE Material Specification 1368.
Lamps: Standard Specifications, Article 1067.02.
Fuse Holder and Fuses: Standard Specifications, Article 1065.01.
Pole Wire: Standard Specifications, Article 1066.09.

Luminaire shall be a 310 watt, multi-volt, "crime-fighter" drop lens unit with high power factor, Autoreg Ballast and a 240 volt connector. Ballast coil shall include all copper coils. The luminaire shall be furnished with no PE receptacle and a skin-over housing. The housing shall include a charcoal filter and rubber gasket, and an encapsulated starter aid. The luminaire shall be furnished with a Chicago "C" cast door; luminaire finish shall be black. The luminaire shall be complete with 310 watt high pressure sodium lamp, ballast, fuses, pole wire, and other ancillary materials.

Submittal Information. The Contractor shall provide complete product information to the Engineer and City personnel according to IDOT District 1 Specifications. The cost of this information shall be included in this item and separate payment will not be made.

Factory Inspection and Testing. The Contractor shall make provisions for factory inspection and testing of the luminaires by City personnel and City representatives according to IDOT District 1 Specifications. The cost of these provisions shall be included in this item and separate payment will not be made. Inspection and testing shall be successfully completed prior to shipping the units.

Installation. Installation shall be as described in Article 821.03 of the Standard Specifications.

Method of Measurement. Each luminaire (complete with lamp, internal ballast, fuses, pole wire, and electrical components, mounting hardware, and other appurtenances) that is furnished and installed as indicated will be counted as a unit for payment.

Basis of Payment. This Work will be paid for at the contract unit price each for LUMINAIRE, STREET LIGHTING, HIGH PRESSURE SODIUM VAPOR, of the type and wattage indicated.

(CTE – 10/29/2004)

CONVENTIONAL STREET LIGHTING UNIT, FOUNDATION MOUNTED

Description. This item consists of furnishing and installing a street light pole including mast arm, attachments and other appurtenances as required at the locations shown on the plans and as designated by the Engineer. The lighting unit shall be complete with all hardware and other ancillary material required for installation. Color shall be satin black.

General Requirements. Perform work in accordance with Section 801 and 830 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials.

Tapered Tubular Steel Pole (5" x 10" x 34'-6", 7 gauge): BOE Material Specification No. 1447 and Standard Drawing 808.

Mast Arm (12 ft.): BOE Material Specification 1450 and Standard Drawing 839.

Submittal Information. Provide complete product information to City personnel and City representatives according to the above BOE and Standard Specifications.

Traffic Signal Attachments. The Contractor shall make provisions for the attachment of traffic signals on the lighting units by Contractor personnel or City representatives according to the plans, and only if locations requiring such attachments are identified on the plans. These provisions will not be included in this item, but shall be coordinated with this item during submittal review, fabrication, and installation. Traffic signal devices and equipment will not be included in this item and will be paid for separately or by others in accordance with the Contract Documents.

Regulatory Signage Attachments. The Contractor shall make provisions for the attachment by others of regulatory signage on the lighting units, as shown on the plans or as directed by the Engineer. These provisions shall not be included in this item, but shall be coordinated with this item during submittal review, fabrication, and installation. Regulatory signs will not be included in this item and will be paid for separately or by others in accordance with the Contract Documents.

Inspection and Testing. The Contractor shall make provisions for factory inspection and testing of the lighting units by City personnel and City representatives according to the above BOE Specifications. Certified, independent paint inspection and testing shall also be performed as directed by the Engineer. The cost of these provisions shall be included in this item and separate payment will not be made. Inspection and testing shall be successfully completed prior to shipping the units.

Installation. Installation shall be in accordance with Articles 830.03, 830.03(a), and 830.03(b) of the Standard Specifications.

Method of Measurement. Each conventional pole lighting unit (pole, mast arm, mast arm attachments, and appurtenances) that is furnished and installed will be counted as a unit for payment.

Basis of Payment. This Work will be paid for at the contract unit price per each for CONVENTIONAL STREET LIGHTING UNIT, FOUNDATION MOUNTED.
(CTE – 10/29/2004)

TEMPORARY LIGHTING UNIT

Description. This item consists of furnishing, installing, and removing a temporary mast arm and luminaire complete with lamp, internal ballast, fuses, electrical components, and mounting hardware for mounting on a temporary traffic signal wood pole as shown on the Plans, as specified herein, and as directed by the Engineer.

General Requirements. Perform work in accordance with Section 801 of the Standard Specifications, the Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials.

Cable Splicing and Termination: Standard Specifications, Article 1066.06

Fuses: Standard Specifications, Article 1065.01(c)

Luminaire Wire: Standard Specifications, Article 1066.09

Lamps: Standard Specifications, Article 1067.02

Mast Arm: BOE Material Specification 1450

Luminaire: BOE Material Specification 1368

Installation. The Contractor shall furnish and install a temporary lighting mast arm, luminaire and all associated electrical equipment to ensure compliance with the applicable codes, standards, and Specifications.

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

The Contractor shall obtain electric power from existing lighting units or controllers as shown on the Plans.

Wiring shall include aerial cables and waterproof splices at each luminaire. Aerial cables will not be included in this Work, but will be paid for under a separate pay item.

The mast arm shall be installed with two bolts to the mast arm attachment. The mast arm attachment shall be banded to the pole at the height and location shown on the plans or as directed by the Engineer. The banding shall be 5/8" stainless steel.

Location of equipment for temporary lighting shall be adjusted and supported to accommodate field conditions encountered, including any potential interferences with other construction or equipment to be installed. The Contractor shall determine the exact location of each temporary lighting fixture prior to installation.

Temporary lighting equipment shall be installed to permit removal of parts requiring periodic replacement or maintenance without damage to other parts.

All equipment furnished shall be functional, new in appearance, and approved by the Engineer. The Contractor shall maintain all of the temporary lighting equipment furnished and installed under this item. No separate payment will be made for maintaining temporary lighting.

Removal. The Contractor shall disconnect and remove the temporary mast arm, luminaire, and all associated electrical equipment upon energizing and acceptance of the permanent lighting system. The mast arm and luminaire shall be removed from the site upon being removed from the temporary wood pole. Removal of aerial cables will not be included in this Work, but will be paid for under a separate pay item. The Contractor shall coordinate the removal of the temporary lighting with traffic signal work.

Method of Measurement. Each temporary lighting installation and removal complete with mast arm, luminaire, and associated hardware as specified herein will be counted as a unit for payment.

Basis of Payment. This Work will be paid for at the Contract Unit Price per each TEMPORARY LIGHTING UNIT, which will be payment in full for the material and work described herein.

Sixty percent of the bid unit price will be paid following acceptance of each installation. The remaining forty percent will be paid following the removal of each installation.

(CTE – 11/02/2004)

CONTROLLER, STREET LIGHTING

Description. This item consists of furnishing and installing an electrical control cabinet and associated equipment and making all connections on a foundation.

General Requirements. Perform work in accordance with Section 801 and 825 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials. The street lighting controller cabinet shall meet the requirements of Bureau of Electricity (BOE) Drawing No. 880.

The voltage specified shall be equated to the service capability of the Commonwealth Edison Company at the given location. The number of circuits to be serviced shall be that as shown on the plans.

The electro-mechanical devices within the cabinet shall be attached to a ½ inch thick phenolic, linen base, bakelite panel as per BOE Drawing No. 884, drilled to accommodate the various devices with allowable clearances, and secured in the cabinet with six 3/8 inch - 18 NC x 7/8 inch stainless steel machine screws.

The circuit breakers, single-pole, or two-pole shall meet the requirements of BOE Material Specification 1428. The mechanically held, remote control contactor, shall be Square-D Company, 8903 Series, Type PVB10 located per BOE Drawing No. 884, or equal as approved by the Engineer.

The cabinet finish shall be satin black to match the street light poles. Finishing procedure shall be powder coat painting in accordance with manufacturer recommendations, and as approved by the Engineer.

Submittals. Final design of the street lighting controller shall be reviewed and approved by the Engineer prior to beginning the manufacture and assembly of the equipment.

Installation. The controller shall be wired as shown on BOE Drawing No. 862. A 200 ampere, two pole main circuit breaker and three pole contactor shall be installed and the branch circuit breaker ampere ratings shall be as indicated on the plans.

For grounding the cabinet, a Thomas and Betts Company "LUGIT TERMINAL" accepting conductor size from #1/0 to #4/0 AWG, or equivalent, shall be attached inside the lower left hand side of the cabinet. It shall be installed with a 3/8 inch x 1 inch brass or stainless steel machine screw in a hole drilled and tapped for this purpose.

The cabinet shall be installed on a concrete foundation as shown on the plans. The foundation will not be included in this Work, but will be paid for under a separate pay item.

Feeder cables and branch circuit cables shall be installed in a neat 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.

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

Method of Measurement. Each lighting controller that is furnished and installed as directed will be counted as a unit for payment.

Basis of Payment. This Work will be paid for at the contract unit price each for a CONTROLLER, STREET LIGHTING of the type and amperage indicated.

(CTE – 10/28/2004)

PAINT EXISTING POLE, POST OR CONTROLLER COMPLETE

Description. This item consists of field painting existing steel and aluminum structures including poles and arms that support street lights and traffic control signals, controller cabinets for both street lights and traffic signals, traffic signal housings, and street light luminaire housings.

Material. All paints and painting materials intended for applications specified herein shall be certified by the Contractor to be of highest quality, shall be from the same manufacturer, and shall conform to the following, as applicable:

- a) Naptha. The solvent to be used for wiping down all metallic surfaces prior to application of paint shall be NAPHTHA conforming to ASTM Standard D838.
- b) Primer. This paint shall meet the requirements of Section 4(composition) and Section 5 (properties) of the Steel Structures Painting Council's Paint Specification No. 25 for red iron oxide, zinc oxide, raw linseed oil and alkyd primer as outlined in Volume 2, Systems and Specifications, Third Edition.
- c) Intermediate Coat. The paint shall meet the same requirements as the primer except that it shall contain a contrasting shade of iron oxide/ or be tinted or shaded to produce a distinct contrast of at least 10 Hunter Delta E units compared to the primer.

- d) Finish Coat. This paint shall meet the requirements of Section 4 (composition) and Section 5 (properties) of the steel Structures Painting Council's Paint Specification No. 21 for lead free white or colored silicone alkyd paint, Type 1, high gloss as outlined in Volume 2, Systems and Specifications, Third Edition.
- e) Color. A paint sample shall be submitted for approval prior to authorization to paint. The color shall be black as specified on the plans. The sample shall be in the form of a 4" by 8" color chip. The Contractor shall provide a field-painted sample, if requested by the Engineer. The field sample shall be of the same type of equipment to be painted and shall be chosen by the Engineer.
- f) Product Data. The Contractor shall submit the manufacturer's technical information, label analysis, and application instructions for each material proposed for use. Each material shall be listed and cross-referenced for the specific coating, finish system, and application. Each material shall include the manufacturer's catalog number.

Delivery, Storage, and Handling.

- a) The materials shall arrive at the job site in the manufacturer's original, unopened packages and containers bearing the manufacturer's name label, product name, product description, manufacturer's stock number, date of manufacture, contents by volume for pigment and vehicle constituents, thinning instructions, application instructions, and color name and number.
- b) Materials to be stored should be kept in tightly covered containers in a well ventilated area at a minimum ambient temperature of 45 degrees Fahrenheit.

Preparation of Surfaces.

- a) Steel Surfaces. Remove loose or scaling paint, dirt, oil grease, rust and foreign matter, as necessary, to receive paint. Wire brushing, where specified herein, shall be done with an approved power tool operated from a portable power source. After wire brushing, the complete surface shall be thoroughly wiped with a rag containing NAPTHA.
- b) Aluminum Surfaces. Remove loose scale and paint, dirt, oil, grease and foreign matter, as necessary, to receive paint. Wire brush surfaces, where necessary, to remove loose scale. Wire brushing, where specified herein, shall be done with an approved power tool operated from a portable power source. After wire brushing, the complete surface shall be thoroughly wiped with a rag containing NAPTHA.
- c) Weather Conditions. Do not apply paint coatings when temperature is below 40 degrees F., or during periods of rain, fog, snow, or when relative humidity is above 85%.
- d) Application Conditions. Surfaces to be painted shall be clean, dry, and relatively smooth. Each paint coating shall be applied smoothly and worked out evenly. Paint shall be thoroughly mixed just prior to application. Thinning shall be held to a minimum, and shall be done only when required for proper application. Thinners to be used shall be the manufacturer's recommended thinner for the paints used; mixed thoroughly to assure complete blending with the coating. Spray painting will not be permitted when wind conditions are greater than 15mph. Painting shall be done as soon after cleaning as possible.

Detail Painting Requirements.

- a) Street Light Poles. Street light poles to be painted under these specifications are steel structures which will vary from twenty-seven (27) to thirty (30) feet in height, with average surface required to be painted of approximately forty-eight (48) square feet. Some rusting and/or bare spots will be encountered which Contractor will be required to wirebrush. The pole shall be thoroughly wiped with NAPTHA, and the finish coating of black applied, as stated on the plans.
- b) Mast Arm Brackets and Electrical Luminaries. Mast arms which are attached to the street light poles will consist of 2-inch steel pipe sections which will vary between eight feet (8') and fifteen feet (15') in length. Mast arms in twelve foot (12') and 15 foot (15') sizes will have a supporting strut of two inch (2") steel pipe. Surface scale and rust will be wirebrushed, and these mast arms thoroughly wiped with NAPTHA, and finish painted with black as stated on the plans.
- c) Traffic Signal Post. Aluminum and steel posts consist of five inch (5") pipe sections atop a conical base or base flange sixteen inches (16") in diameter, and will vary in height from three feet six inches (3' - 6") to twenty feet (20'). Spot scaling shall be wirebrushed and the posts thoroughly wiped with NAPTHA, and finish painted with black as stated on the plans.
- d) Street Light Controllers. The control cabinets will be cast aluminum and are approximately 18" x 14" x 30" in size. They will be mounted atop a three foot six inch (3' 6") high post. The Contractor shall wirebrush, as necessary, and thoroughly wipe the complete cabinet and casting with NAPTHA, and apply finish coating of black to all surfaces as stated on the plans.

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

Basis of Payment. This Work will be paid for at the contract unit price each for PAINT EXISTING POLE, POST OR CONTROLLER COMPLETE.

(CTE – 10/28/2004)

REMOVE EXISTING LIGHTING CONTROLLER AND SALVAGE

Description. This item consists of disconnecting, removing, dismantling, and transporting to a City storage facility an existing street lighting controller unit and all associated mounting hardware and appurtenances, removing and disposing of its foundation, and backfilling the excavated areas. Work shall be performed as specified herein, as shown on the plans and as directed by the Engineer.

General Requirements. Perform work in accordance with Section 801 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Removal of Street Lighting Controller Unit, Owner Salvage. The street lighting controller unit and all associated hardware and appurtenances will remain the property of the City of Chicago. The line side cable shall be removed back to the utility source, as directed by the Bureau of Electricity (BOE) field representative. Branch circuit cables shall be removed or reconnected as directed by the Bureau of Electricity (BOE) field representative. Removed cable will become the property of the Contractor, and shall be disposed of outside the right of way by the Contractor. Cable removal or reconnection, including any required temporary splices, will not be paid for separately but shall be included in this item at no additional expense.

The Contractor shall deliver the removed street lighting controller units to a City of Chicago Yard in Chicago, Illinois. City stock material returns will require a minimum of 48 hours prior notice to the BOE Representative (312) 746-4636. The Contractor shall complete and fax (312) 746-4626 an advance copy of the State's form(s) GF-2 to the BOE Representative for review. The Representative will review the completed form(s) and advise on a schedule of material delivery.

The Contractor shall provide three (3) final copies of the State's form(s) GF-2, listing the quantities and type of equipment that is to remain the property of the City, to the BOE Representative upon delivery. The completed forms shall include equipment model and serial numbers where applicable. The Contractor shall also provide a copy of the Contract plans or special provisions showing the quantities and type of equipment. The Contractor will be responsible for the condition of the lighting controller from the time of removal until the acceptance of a receipt drawn by the City indicating that the items have been returned in good condition.

Foundation Removal. Foundation removal shall be in accordance with Section 845.05 of the Standard Specifications.

Method of Measurement. Each street lighting controller unit that is removed and salvaged, including the foundation that is removed and disposed of, as indicated, will be counted as a unit for payment.

Basis of Payment. This Work will be paid for at the contract unit price each for REMOVE EXISTING LIGHTING CONTROLLER AND SALVAGE.

(CTE – 10/28/2004)

REMOVE EXISTING LIGHTING UNIT AND SALVAGE

Description. This item consists of disconnecting, removing, dismantling, and transporting to a City or local storage facility, an existing street lighting unit as specified herein, as shown on the plans and as directed by the Engineer.

General Requirements. Perform work in accordance with Section 801 and 842 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Removal. Street lighting pole (anchor base or embedded), ballast housing base, mast arms, bracket arms, pole mounted luminaires, and all associated hardware and appurtenances will remain the property of the City of Chicago. Embedded poles shall be removed by means other than burning where possible. Street lighting cable shall be removed or reconnected as required back to the last unaffected source as directed by the Bureau of Electricity (BOE) field representative. Removed cable will become the property of the Contractor, and shall be disposed of outside the right of way by the Contractor. Cable removal, or reconnection, including any required temporary splices, will not be paid for separately but will be included in this item at no additional expense.

Delivery to City. The Contractor shall deliver the removed street lighting units to a City of Chicago Yard in Chicago, Illinois. City stock material returns will require a minimum of 48 hours prior notice to the BOE Representative (312) 746-4636. The Contractor shall complete and fax (312) 746-4626 an advance copy of the State's form(s) GF-2 to the BOE Representative for review. The BOE Representative will review the completed form(s) and advise on a schedule of material delivery.

The Contractor shall provide three (3) final copies of the State's form(s) GF-2, listing the quantities and type of equipment that is to remain the property of the City, to the BOE Representative upon delivery. The completed forms shall include equipment model and serial numbers where applicable. The Contractor shall also provide a copy of the Contract plans or special provisions showing the quantities and type of equipment. The Contractor shall be responsible for the condition of the street lighting equipment from the time of removal until the acceptance of a receipt drawn by the City indicating that the items have been returned in good condition.

Method of Measurement. Each lighting unit (ballast housing or pedestal base, pole, mast arms, bracket arms, luminaires, and appurtenant equipment) that is removed and salvaged as indicated will be counted as a unit for payment.

Foundations and embedment removal is not included in this item.

Basis of Payment. This Work will be paid for at the contract unit price per each for REMOVE EXISTING LIGHTING UNIT AND SALVAGE.

(CTE – 10/15/2004)

CONTROLLER, TRAFFIC, 16 LOAD BAY, P CABINET

Description. This item consists of furnishing and installing a traffic signal controller and associated equipment in a cabinet onto a foundation and making all necessary connections.

General Requirements. Perform work in accordance with Sections 802 and 857 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Material. The material must meet the requirements of BOE Material Specification 1469. The cabinet shall be a P cabinet 55 inches high by 44 inches wide by 26 inches deep with 16 load bays. Each load bay shall include a load switch. No communications interface equipment shall be included.

Installation Requirements. The controller shall be enclosed in a housing and installed in a completely wired cabinet. The model and serial numbers of the controller shall be affixed on the front of the controller housing and be readily visible. The cabinet shall be set onto a pad foundation designed specifically for the cabinet, and affixed with four bolts provided with the foundation.

The controller shall be programmed to provide the sequencing and timing of operation as shown on the plans. Electric cables inside the cabinet shall be neatly trained along the base and back of the cabinet. Each conductor used shall be connected individually to the proper terminal, and the spare conductors shall be insulated and bound into a neat bundle. Each cable shall 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 shall be wired to a separate circuit whether or not the signal plans call for a split movement. Maximum load per signal circuit shall be set not to exceed 700 watts. Final offset timing of the time base coordinator will be set in the field by City personnel.

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

Color. Color of the exterior surfaces of the cabinet must be black unless otherwise noted on the plans and directed by the Engineer. Color must conform to City of Chicago Standard Specifications. A color sample must be submitted to the Engineer for approval prior to fabrication.

Method of Measurement. Each Controller will be measured on a per each basis as installed and accepted by the Engineer and the Bureau of Electricity.

Basis of Payment. This Work will be paid for at the contract unit price each for CONTROLLER, TRAFFIC, 16 LOAD BAY, P CABINET.

(CTE – 10/28/2004)

STAR MODEM

Description. This item consists of furnishing and installing an external star modem and associated communications connections in controller cabinets as shown on the plans or directed by the Engineer.

Materials. The external star modem shall be fully compatible with the internal fiber optic modems in the system master and local controllers, and shall be located within the controller cabinet. The star modem shall be capable of splitting multimode signals into three or more directions while maintaining the multi-drop, polling operation of the closed loop system.

Installation Requirements. Additional electric and fiber optic cables inside the cabinet shall be neatly trained along the base and back of the cabinet. Each conductor used shall be connected individually to the proper terminal and the spare conductors shall be insulated and bound into a neat bundle. Each cable shall be marked with suitable identification.

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

Basis of Payment. This Work will be paid for at the contract unit price each for STAR MODEM. The price will also include all fiber jumper cables, wiring and connections to the star modem.

(CTE – 10/28/2004)

TRANSCEIVER, FIBER OPTIC

Description. This item consists of furnishing and installing a fiber optic transceiver that is fully compatible with the LMD-40 pretimed controllers specified elsewhere in these Special Provisions.

General Requirements. Perform work under this item in accordance with Section 864 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Code, except as herein modified.

Fiber Optic Communications Module. The fiber optic communications module shall be a Peek LMC-4 Internal Multi-Mode Fiber Optic Modem or approved equal identical to those supplied with the pretimed controllers. The module shall be internal to the LMD-40 series controller. It shall communicate at up 4800 baud at a wavelength of 850 nm. The module shall utilize industry standard ST compatible connectors for the primary (receive) and secondary (transmit) ports to provide full-duplex operation.

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

Basis of Payment. This Work will be paid for at the contract unit price each for TRANSCEIVER, FIBER OPTIC. Such price will include the cost of furnishing the unit complete with all documentation, hardware and accessories necessary for proper operation.
(CTE – 10/15/2004)

ELECTRIC CABLE IN CONDUIT NO. 12, 19/C

Description. This item consists of furnishing and installing electric cable in conduit for traffic signals of the type, size and number of conductors as specified on the plans.

General Requirements. Perform work in accordance with Sections 802, 817, and 873 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials. All cable shall conform to the requirements of BOE Material Specification 1474, for Traffic Signal Cable.

Installation Requirements. All cable shall be installed in conduit, as indicated on the plans, with care to prevent damage to the insulation or cable. Suitable devices shall be used in pulling the cable, and only approved lubricants shall be used. All cables installed in conduit will be from the power source to the traffic signal controller, from the traffic controller to the City traffic signal junction box, or from junction box to junction box. Cables that terminate in a traffic signal controller or traffic signal junction box shall extend two inches (2") above the bottom of the box, or cabinet, and the following procedure shall be followed:

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.

Traffic Signal Junction Box.

- (1) Remove twenty four inches (24") 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 side and back of the box.
- (5) Connect all conductors to terminal strip.

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

<u>Location</u>	<u>Length of Slack Cable (feet)</u>
Base of Controller Post	1
Detector, Junction Box	1
Base of Traffic Signal Post or Traffic Signal Pole	2
City Handhole	6
City Manhole	12
Commonwealth Edison Manhole	25

Cable slack in manholes/handholes shall be trained and racked in the holes. If racks are non-existent, racks shall be provided, which will be a part of a separate pay item.

No cable splices shall be allowed for traffic signal cable.

Method of Measurement. This Work will be measured horizontally between changes in direction, plus slack cable of the length shown above. Vertical cable will not be measured for payment.

Basis of Payment. This Work will be paid for at the contract unit price per lineal foot for ELECTRIC CABLE IN CONDUIT NO. 12, 19/C.

(CTE – 10/25/2004)

FIBER OPTIC HYBRID CABLE IN CONDUIT 6SM/6MM

Description. This item consists of furnishing and installing fiber optic cable in an innerduct within a conduit, as shown on the plans or as directed by the Engineer.

Material. The cable shall meet the requirements of BOE Material Specification 1482.

Overview. The Dan Ryan Phase II Frontage Road (Wentworth/Wells) traffic signal interconnect system shall consist of one closed loop system. The following is a list of intersections included in the closed loop system.

Closed Loop System

1. Wentworth and 47th.
2. Wells and 47th.
3. Wentworth and 51st.
4. Wells and 51st.
5. Wentworth and 55th.
6. Wells and 55th.
7. Wentworth and 57th.
8. Wells and 57th.
9. Wentworth and 59th.
10. Wells and 59th.
11. Wentworth and 63rd.
12. Wells and 63rd.

63rd Street bridge intersections with Wentworth Avenue and Wells Street will be interconnected as part of this Contract. 47th, 51st, 55th, 57th, and 59th Street bridge intersections with Wentworth Avenue and Wells Street will have their own individual interconnect contracts.

As part of a separate contract, the above listed intersection will be ultimately interconnected to a master controller at northeast corner of eastbound Garfield and Wentworth forming a single closed loop system.

The controllers at above intersections shall use an RS-232 interface to transfer data from the controller to a fiber optic modem. The optical modems shall operate in a drop-and-insert configuration, where each modem receives (drop) or transmits (insert) information relative to that local site. In addition, the modem shall regenerate signals from down stream modems with no loss of data or degradation of performance. This is also known as a daisy-chained configuration.

General Requirements.

Hybrid Fiber Optic Cable. The cable shall meet, as a minimum, the following specifications and conform with the latest issue of Bellcore TR-TSY-00020: Generic Requirement for Optical Fiber and Optical Fiber Cables. ANSI/EIA-472: Generic Specification of Fiber Optic Cables, and REA-PE-90; and appropriate Sectional Specifications thereof.

Cable Construction.

Cable construction, other than as specified, shall be approved by the Engineer.

1. The cable shall be constructed entirely from dielectric material.
2. A cable suitable for either direct installation into a duct bank or conduit shall be supplied.
3. The cable shall be of gel-filled, loose tube construction with up to 12 buffer tubes wrapped around a dielectric central strength member. All fiber(s) shall be contained within buffer tubes, and each buffer tube shall have an inside diameter much greater than the total diameter(s) of the fiber(s) it supports.

4. Each fiber or group of fibers shall be free-floating within the tubes such that all mechanically or environmentally induced stress placed upon the cable is de-coupled from the fibers. The air within the buffer tubes shall be displaced with a gel to prevent entry by water and to facilitate free movement of the fiber(s) within.
5. The buffer tubes shall be color coded in compliance with EIA/TIA-598: Color Coding of Fiber Optic Cables.
6. Cables constructed of less than six fibers shall have a buffer tube provided for each fiber: cables constructed of more than six fibers may have several fibers occupy a buffer tube, with equal distribution of fibers as far as practicable. All fibers shall be color coded in compliance with EIA/TIA-598: Color Coding of Fiber Optic Cables. Single-mode and multimode fibers shall not occupy the same buffer tube.
7. In buffer tubes containing multiple fibers, the colors shall be stable during temperature cycling and not subject to fading or smearing onto each other or into the gel filling material. Colors shall not cause fibers to stick together.
8. The cable shall have an interstitial filing between the buffer tubes and throughout the remainder of the cable to prevent entry of water.
9. A binder wrapping strength member of aramid fibers shall be provided as a final layer prior to application of the outer jacket.
10. The cable shall be provided in continuous lengths. Each fiber shall be pulled from the same optical waveguide form and shall be free of splices. Each optical fiber shall consist of a doped silica core surrounded by a concentric silical cladding: the use of any other material shall be approved by the Engineer.
11. A permanent marking shall be employed on the outer jacket of the cable which shall show the date of manufacture and the manufacturer's name. A numerical sequence shall be marked on the outer jacket, at intervals no greater than ten (10) feet, to facilitate determination of length of cable and amount of cable remaining on the reel. The height of the marking shall be 2.5 mm nominal.
12. All optical fibers shall be proof tested by the fiber manufacturer at a minimum load of 100 kpsi.
13. All optical fibers shall be 100% attenuation tested at the factory for compliance with performance specifications described herein. The attenuation of each fiber shall be provided with each cable reel.
14. The outer jacket shall be constructed of medium density polyethylene, minimum jacket thickness of 1.4 mm. Jacketing material shall be applied directly over the tensile strength members and flooding compound. The outer jacket shall be UV and fungus resistant.

Singlemode Optical Specifications.

1.	Optical Specifications:	
	Operation Wavelength	1,300 nm and 1,550 nm
	Optical Attenuation	@ 1,300 nm: 0.7 dBI/km @ 20C @ 1,550 nm: 0.6 dB/km @ 20C
	Optical Dispersion	@ 1,300 nm: 3.5-4.5 psec/nm-km @ 1,550 nm: (</=) 20 psec/nm-km
	Zero Dispersion Wavelength	1,300 to 1,320 nm. Nominal
	Zero Dispersion Slope	<=0.092 ps/nm ² -km
	Fiber Core Diameter	8.3 um. Typical
	Fiber Coating Diameter	250+/-10 um
	Fiber Cladding Diameter	125+/-2 um
	Core to Cladding Offset	<=0.8 um
	Cladding Non-Circularity	<=1.0%
	Spot Size	9.3+/-0.5 um @ 1300 nm 10.5+/-1 um @ 1550 nm
	Cutoff Wavelength	<=1250 nm

Multimodal Optical Specifications.

1.	Optical Specification:	
	Operation Wavelength	850 nm and 1.300 nm
	Optical Attenuation	@ 850 nm: 400 MHZ-km @ 20C @ 1,300 nm: 400 MHZ-km @ 20C
	Fiber Core Diameter	62.5 um +/-3.0 um
	Fiber Coating Diameter	250 +/-15 um
	Fiber Cladding Diameter	125 +/-2.0 um
	Core to Cladding Offset	<=3.0 um
	Cladding Non-Circularity	<=2.0%
	Core Non-Circularity	<=6.0%
	Numerical Aperture	0.275+-0.015
	Index	Graded Index

Hybrid Cable Mechanical Specifications.

Crush Resistance	5,000 n/m. Length of cable
Cable Outside Diameter	0.50" nominal
Minimum Bending Radius:	
Installation	20 times the cable diameter
Static	10 times the cable diameter
Temperature:	
Installation	-30C to +70C
Storage/Operation	-40C to +70C
Humidity	0 to 100%
Tensile Strength:	
Installation	2,700 N (600 ibf)
Static	600 N (135 ibf)

Installation. Cable shall be pulled through the conduit or innerduct as shown on the plans, or as directed by the Engineer. The manufacturer's instructions shall be carefully followed so as not to damage the cable. After the cable is pulled, traces shall be obtained from the installed cable using an OTDR (Optical Time Division Reflectometer) to insure that the cable is good. A bad trace will require that new cable be installed.

Method of Measurement. The cable will be measured per foot installed, and will include slack. Splicing and terminating fiber optic cable will be covered by different items.

Basis of Payment. This Work will be paid for at the contract unit price per foot for FIBER OPTIC HYBRID CABLE IN CONDUIT 6SM/6MM.
(CTE – 10/28/2004)

TRACER CABLE

Description. This item consists of providing a trace cable (copper #10) with fiber optic cable in conduit for the purpose of locating a utility.

General Requirements. This Work shall be in accordance with Section 871 Standard Specifications and the City of Chicago Bureau of Electricity, except as herein modified.

Method of Measurement. The length of measurement will be the distance horizontally measured between changes in direction.

Basis of Payment. This Work will be paid for at the contract unit price per lineal foot for TRACER CABLE.
(CTE – 10/28/2004)

ELECTRIC CABLE IN CONDUIT, COAXIAL VIDEO, RG-59/U

Description. This item consists of furnishing and installing electric cable of the size, type and number of conductors specified on the plans.

General Requirements. Perform work in accordance with Sections 801, 802, and 873 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified. The cable shall comply with the following requirements.

Materials. Coaxial cable shall be 75 ohm and shall not have an attenuation greater than 10 dB/100 feet at 900 MHz. As part of this Contract, coaxial cable will run from an additional junction box provided on a combination pole to the manhole near the controller as shown on the plans. The cable shall be coiled and racked with slack for future connection to the controller by Contract 9B8 (62802).

Installation. All cable shall be installed in conduit, aerially or in poles, as indicated on the plans, with care to prevent damage to the insulation or cable. Suitable devices shall be used in pulling the cable and only approved lubricants shall be used. All cables installed in conduit shall be from the power source to the traffic signal controller, from the traffic controller to the City traffic signal junction box, from junction box to junction box, or as shown on the plans. Signal and service cables that terminate in a traffic signal junction box shall extend 2 feet above the bottom of the box or cabinet and the following procedure shall be followed:

a. Controllers

- (1) Remove 36 inches of neoprene jacket.
- (2) Wrap vinyl electrical tape on 2 inches of the neoprene jacket and on 2 inches of the insulated conductors.
- (3) Remove one (1) inch 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 24 inches of neoprene jacket.
- (2) Wrap vinyl electrical tape on 2 inches of neoprene jacket and on 2 inches of the insulated conductors.
- (3) Remove 1 inch of insulation and scrape copper conductor.
- (4) Train cables neatly along the side and back of the box.
- (5) Connect all conductors to terminal strip.

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

<u>Location</u>	<u>Length of Slack Cable</u>
Base of Controller Post	1 foot
Detector, Junction Box	1 foot
Base of Traffic Signal Post or Traffic Signal Pole	2 feet
Controller Cabinet	3 feet
City Handhole	6 feet
City Manhole	12 feet
Commonwealth Edison Manhole	25 feet

Cable Splices. Cable splices shall be made only for magnetic detector leads, detector loops, and existing copper interconnect cable or at locations shown on the plans. Make splices in accordance with Article 873.03 of the Standard Specifications.

Method of Measurement. The length of measurement shall be the distance horizontally measured between changes in direction including slack cable. All vertical cables will not be measured for payment. Lengths of slack cable required will be paid for at the Contract Unit Price per lineal foot for cable of the type specified.

Basis of Payment. This Work will be paid for at the contract unit price per lineal foot for ELECTRIC CABLE IN CONDUIT, COAXIAL VIDEO, RG-59/U.

(CTE – 10/26/2004)

MAST ARM, STEEL

Description. This item consists of furnishing and installing a steel, monotube, mast arm for the purpose of supporting traffic signals, and/or illuminated or painted signs on an anchor base pole at the locations shown on the plans, or as specified or directed by the Engineer. The length of the mast arm and the angular orientation of the arm relative to the centerline of the roadway shall be as indicated on the plans.

A mast arm shall be installed only on a 3 gauge pole, and the length of the mast arm shall govern the minimum base diameter of the pole on which the arm is to be installed, in accordance with the following chart:

MAST ARM	POLE BASE
LENGTH (feet)	DIAMETER (inches)
35	12.5

General Requirements. Perform work under these items in accordance with Sections 800 and 1086 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials. The mast arm shall be 7 gauge steel meeting the requirements of BOE Standard Drawing 870 and the applicable sections of BOE Material Specification 1447.

Installation. The mast arm shall be mounted on the pole at the height specified on BOE 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 shall be field drilled in the pole in line with the orientation of the mast arm. The hole shall 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 shall be inserted into the finished hole prior to the installation of the cable.

Two holes shall 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 shall be drilled after the mast arm is in place in order that the position of the holes shall match the location of the locator bushings attached to the back half of the clamp.

All signals, signs, and electrical equipment shall 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 shall be coordinated with the attachment of the mast arm to the pole. The clamp bolts shall 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 shall be secured in place with the attachment screws provided.

Painting. The mast arm shall be delivered completely finished with a factory applied powder coat per BOE Material Specification 1447. The Contractor shall utilize non-abrasive slinging materials and shall otherwise exercise due care in erecting the pole and mast arm to prevent any damage to the finish.

Color. Color shall be black conforming to City of Chicago Standard Specifications. A color sample shall be submitted to the Engineer for approval prior to fabrication.

Method of Measurement. This Work will be measured per each basis.

Basis of Payment. This Work will be paid for at the contract unit price for each MAST ARM, STEEL, of the type and length indicated.

(CTE – 10/26/2004)

POLE STEEL, ANCHOR BASE

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

General Requirements. Perform work under this item in accordance with Sections 800, 877, and 830 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials. The pole shall meet the requirements of BOE Material Specification 1447.

Installation Requirements. The pole shall 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 shall be used as shown on BOE Drawing No. 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 shall be cut off to provide the necessary clearance. The excess shall not be burned off. The pole shall be set secure, properly orientated, and plumb using the nuts and washer provided with the anchor bolts. The bolt covers, handhole cover, and pole cap shall be securely attached.

Painting. The pole shall be delivered completely finished with a factory applied powder coat paint system. The Contractor shall utilize non-abrasive slinging materials and shall exercise due care in erecting the pole and mast arm to minimize any possible damage to the finish. When necessary, the Contractor shall use factory approved touch-up materials and methods to restore the finish to like new appearance and durability.

Color. Color shall be black conforming to City of Chicago Standard Specifications. A color sample shall be submitted to the Engineer for approval prior to fabrication.

Method of Measurement. This item will be measured per each unit installed, complete with anchor bolt covers, pole cap, and handhole cover.

Basis of Payment. This Work will be paid for at the contract unit price each for POLE, STEEL, ANCHOR BASE, of the type, length, diameter and gauge indicated, which will be payment in full for the material and work described herein. Light standard foundations, mast arms, and luminaires will not be included in this pay item but will be paid for separately.
(CTE – 10/25/2004)

CONCRETE FOUNDATION

Description. This item consists of furnishing and installing concrete foundations at the locations shown on the plans or as directed by the Engineer. Work includes drilling of foundation shaft, furnishing and installing assemblies of steel reinforcing bars, anchor bolt assemblies and electrical conduit and bushings; swabbing and clearing the electrical conduits; and furnishing, placing and finishing concrete foundations.

General Requirements. Perform work in accordance with Sections 836 and 878 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials. Anchor bolts shall conform to BOE Material Specification 1467.

Construction. Twenty-four inch diameter foundations shall conform to BOE Drawing No. 818. Thirty inch diameter foundations with 16.5 inch bolt circles shall conform to BOE Drawing Number 817.

The top surface of these foundations shall be set at an elevation of two inches (2") above grade or as directed by the Engineer. Care shall be taken to install a level foundation and to provide adequate anchor rod projections for double-nut installation. The foundations shall be centered back from the face of the curb as shown on the plans.

Foundation raceways shall consist of large radius conduit elbow(s) in quantity, size and type shown on the plans. The elbow ends above ground shall be capped with standard conduit bushings. The foundation top shall be chamfered 3/4 of an inch.

Anchor bolts shall be set so that when poles are mounted on the foundations, the street lighting mast arm shall be properly oriented as indicated on the plans. The anchor bolts shall be set by means of a metal template which shall be submitted for approval before any foundation work is begun. The template shall hold the bolts vertical, and in proper position, and shall serve as a form for the top six (6) inches of the periphery of the foundation.

Ground Rods.

1. Ground rods for roadway lighting foundations shall be 3/4" x 10' in size which will be paid as a separate item.
2. Ground rods for traffic signal foundations shall meet BOE Material Specification 1465, which will be paid as part of foundation.

Method of Measurement. This item will be measured for payment in feet of the foundation in place. Extra foundation depth, beyond the directive of the Engineer, will not be measured for payment.

Basis of Payment. This Work will be paid for at the contract unit price per foot of CONCRETE FOUNDATION, of the type, diameter, and anchor rods size indicated.
(CTE – 11/04/2004)

CONCRETE FOUNDATION FOR TYPE "P" BASE MOUNTED TRAFFIC SIGNAL CONTROLLER

Description. This item consists of furnishing and installing a Concrete Foundation for a Base Mounted Traffic Signal Controller as shown on Bureau of Electricity Drawing No. 888.

General Requirements. Perform work in accordance with Section 878 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

The foundation shall have a minimum depth of forty inches (40") below grade. The foundations shall be centered back from the face of the curb as shown on the plans. The foundation top shall be chamfered 3/4 of an inch.

The Contractor shall furnish anchor bolts, hardware, conduit elbows, and all other material shown on the foundation construction drawing. Concrete shall be Class SI according to Article 1020 of the Standard Specifications. Ground rods shall conform to BOE Material Specification 1465.

All excavation and restoration of parkways to original conditions shall be considered as part of this item. Dispose of excess material according to Article 202.03 of the Standard Specifications.

Method of Measurement. This Work will be measured per each foundation installed, complete and in place.

Basis of Payment. This Work will be paid for at the contract unit price of each for CONCRETE FOUNDATION FOR TYPE "P" BASE MOUNTED TRAFFIC SIGNAL CONTROLLER CABINET.

(CTE – 10/15/2004)

SIGNAL HEAD, POLYCARBONATE, LED, 1-FACE

Description. This item consists of furnishing and installing a traffic signal head or combination of heads on a street light pole, a traffic signal pole, a traffic signal post or on a Traffic signal monotube mast arm as shown on the plans, as specified herein, or as directed by the Engineer.

General Requirements. Perform work under this item in accordance with Sections 802 and 881 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials. The traffic signal head shall meet the requirements of BOE Material Specification 1493 for a "Traffic Signal" Twelve-Inch Single Face, Single or Multiple Section, Polycarbonate, LED or Incandescent", adopted March 20, 2000 with the exception that all traffic signal heads installed as part of this project shall be LED signal heads. The use of incandescent lamps is expressly prohibited. The sizes of the lenses shall be as indicated on the plans. The mounting brackets shall meet the requirements of BOE Material Specification 1495.

The material for a programmed head shall meet the BOE Material Specification 1496 for Optically Programmed Signal Heads.

The lamp for the optically programmed signal will be a General Electric Company product, 150 watt sealed beam lamp, with rated life of 6000 hours, or equivalent. The LED signals shall be equipped with the proper LED optical unit.

The type of installation shall 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 shall be as indicated in the plans and in the BOE Standard Drawings.

Each signal face shall be pointed in the direction of the approaching traffic that it is to control and shall 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. The optically programmed signal face shall be veiled in accordance with the visibility requirements at the direction of the Engineer.

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

Installation Requirements.

Pole Mounted. The signals shall be mounted using pole mounting brackets meeting BOE Material Specification 1495, banded to the pole with two strips of $\frac{3}{4}$ inch 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 shall be coated with a baked-on black finish. The mounting configuration connecting the signals to the mounting bracket shall consist of sections of $1 \frac{1}{2}$ inch polycarbonate conduit of precise lengths, as indicated on the standard drawing, to create the designated structure, connected with cross fittings per BOE Standard Drawing 741.

Mast Arm Mounted. The signal shall be mounted on the mast arm using a mounting device meeting the requirements of BOE Material Specification 1463, at the position on the mast arm as indicated on the drawing in the manner shown on BOE Drawing 834. The Bracket shall be banded to the mast arm with the 5/8 inch banding as shown on BOE Drawing Number 834. The banding and clips shall have a baked-on black finish. The Bracket shall be located over a hole drilled into the mast arm for the installation of cable. The hole shall be reamed or filed to remove any sharp edges to burrs which might damage cable during installation or through vibration when the signals are in operation.

Cable. The Contractor shall provide and install a length of 8/C #18 flexible electrical cord, as per BOE Material Specification 1475, 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, shall be sufficient to match the requirements of the signal head being installed, and shall be connected in accordance with BOE Material Specification 1493, for the "Traffic Signal Twelve Inch Three or Single Section, One Way", or BOE Material Specification 1496, for "Optically Programmed Signals". Both ends of the cable length shall be carefully stripped of six inches (6") of jacket and one inch (1") of insulation, and each conductor properly tinned.

- a) Mast Arm Mounted Service Cable. The service cable from the signal heads shall enter the traffic signal mast arm through the hole from the mounting bracket, whence it shall 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, BOE Drawing Number 12268 A.
- b) Pole Mounted Service Cable. The service cable from the signal heads shall enter the pole through the bottom ULB-1 mounting bracket and enter the long sweep elbow to terminate by attachment to the terminal strip in the junction box in accordance with connector schematic, BOE Drawing Number 12268-A.

Color. Color shall be black conforming to City of Chicago Standard specifications. The signal head housings, mast arms, the pole mounting brackets, and the crosses shall be black in color as designated by the Engineer. When the signals are mounted on the pole, the mounting hardware shall be painted to match the pole.

Method of Measurement. This Work will be measured on a per each basis as installed and accepted by the Engineer and the Bureau of Electricity.

Basis of Payment. This Work will be paid for at the contract unit price each for SIGNAL HEAD POLYCARBONATE, LED, 1-FACE of sections and mounting type indicated.
(CTE – 10/28/2004)

PEDESTRIAN SIGNAL HEAD, POLYCARBONATE, 1 FACE, LED, BRACKET MOUNTED

Description. This item consists of furnishing and installing a pedestrian signal on a street light pole, a traffic signal pole or a traffic signal post as shown on the plans, as specified herein, or as directed by the Engineer. The signal may be installed as a single unit on a pole or in combination with other pedestrian signals or with traffic signals of various types and sizes. Specific installations and configurations are shown on BOE Drawing Numbers 834 and 835 entitled "Standard Traffic Signal Mounting Details".

Materials. The pedestrian signal head shall meet the requirements of BOE Material Specification 1494. All housing units shall be made of polycarbonate. Mounting hardware shall meet the requirements of BOE Material Specification 1495.

General Requirements. Perform work in accordance with Sections 800, 881, 1078.02 of the Standard Specifications, Bureau of Electricity Standards and the City of Chicago Electrical Code, except as herein modified.

The method of mounting shall be indicated on the plans. Each signal face shall be pointed in the direction of the marked cross-walk area for the pedestrians it is intended to control.

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

Installation Requirements.

The signal shall be mounted using pole mounting brackets meeting BOE Material Specification 1495, banded to the pole with two strips of ¾ inch 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 shall have a baked-on black finish. The mounting configuration connecting the signals to the mounting bracket shall consist of sections of 1½ inch polycarbonate conduit of precise lengths as indicated on the standard drawing to create the designated structure, connected with cross fittings per BOE Standard Drawing 741, as required.

The bottom mounting bracket shall be accurately located to cover a hole 1 inch in diameter for cable entrance drilled into the pole or standard at a height calculated to position the bottom signal face at a standard height of 10 feet, or a height indicated on the plans. The hole shall 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 shall be installed using the same opening as the traffic signal cord.

Cable.

The Contractor shall provide and install a length of 8/C #18 AWG flexible electric cord, per BOE Material Specification 1475, 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, shall be sufficient to match the requirements of the signal head being installed, and shall be so connected in accordance with BOE Material Specification 1494. Both ends of the cable shall be carefully stripped of six inches (6") of jacket and one inch (1") of insulation, and each conductor properly tinned. The cord shall be attached to the terminal block in the junction box in accordance with the terminal strip connector schematic, Bureau of Electricity Drawing Number 12268-A.

The service cord from the signal head shall 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.

Color. Color shall be black as indicated on the plans.

Method of Measurement. Each pedestrian signal head will be counted as a unit for payment.

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.
(CTE – 10/26/2004)

VIDEO SYSTEM DETECTION CAMERA, VIDEO DETECTION PROCESSOR

Description. This item consists of furnishing, installing, and testing a video system detection camera and a video system detection processor for vehicular traffic, complete with all mounting hardware, hybrid cable pigtails, and software required for a fully operational system that provides all the features and functions described herein shown on the plans or directed by the Engineer.

The video detection system shall accommodate present and future vehicular traffic system detection requirements for the City of Chicago.

The work shall include all shop drawings and sample submittals as required for the detection system. The work shall also include such items as identification tags for equipment and manuals for the operation and maintenance of the system.

The video camera shall be a Philips VPK351A Series camera that is fully compatible with all other components in the system. The camera shall be a 1/3 inch format monochrome interline transfer CCD camera with a signal-to noise ratio (SNR) of at least 50 dB. The camera shall have an integral IR filter. The camera shall provide a usable video image with an imager illumination of 0.0014 footcandles (0.014 lux) and full video output with an imager illumination of 0.0055 footcandles (0.055 lux). The video output shall be 1.0 V peak-to-peak into 75 ohms.

A power zoom lens shall be supplied with the camera. The zoom lens shall be continuously adjustable within a range of at least 6 mm to 60 mm. The lens shall have an automatic iris.

The camera shall be enclosed in a cylindrical aluminum housing. The housing shall have aluminum endcaps. The front endcap shall have a glass window with a heater to minimize fogging and condensation on the outside of the window. The rear endcap shall have a single multipin corrosion-resistant connector for video, power, and lens control wiring. The housing with endcaps installed shall meet the requirements of NEMA-4, IP65, Enclosure Type 3. The housing shall have a white, weather-resistant finish.

The assembled camera and housing shall be operational at external temperatures of -40°C to +50°C (-40°F to 122°F). A sunshield shall provided with the housing. The sunshade shall have a white, weather-resistant finish.

A hybrid cable pigtail shall be supplied with the camera assembly. The pigtail shall consist of an RG-59/U coaxial cable for the video signal, a multiconductor cable for power to the camera, and a multiconductor cable for zoom lens control. The hybrid cable shall be terminated on one end with a connector that mates with the multipin connector on the camera housing. The other end of the hybrid pigtail will be unterminated. The hybrid pigtail shall be sixty (60) feet in length.

Camera Video Processing Unit and Interface.

The video processor shall be a Peek Traffic VideoTrak-905 that is fully compatible with all other components in the system. The processor shall be capable of accommodating inputs from up to 8 monochrome cameras in NTSC format.

The video processor assembly shall meet or exceed NEMA TS-2 environmental specifications.

The video processor shall consist of a chassis into which up to ten (10) VME (VersaModule European) 3U modules and a power supply can be installed. A typical installation shall consist of either one or two video processor modules, one or two input/output modules, and a power supply.

The video processor module (VPM) shall be a 3U module. The VPM shall provide four (4) camera inputs for video detection and one (1) input for an additional video source. The camera inputs shall accept either monochrome (RS-170) or color (NTSC) inputs. Any of the video inputs shall be individually selectable to be routed to a video output connection for system setup or monitoring. The VPM shall be able to automatically select the five video inputs in a user-defined sequence and route each input sequentially to the output.

An input/output (I/O) module shall be supplied and installed with each VPM. The I/O module shall be a 3U module and shall provide 32 outputs and 16 inputs. The inputs and outputs shall be accessed through a D-subminiature connector for connection to the backpanel in the traffic signal controller cabinet. The I/O module shall support either 12V or 24V operation, selected by a jumper within the module, for compatibility with the traffic signal control equipment.

The power supply module shall operate on either 120VAC at 60 Hz or 240VAC at 50 Hz. The power supply shall include a 3-wire cord and grounded plug.

Method of Measurement. This Work will be measured on a per each basis as installed and accepted by the Engineer and the Bureau of Electricity.

Basis of Payment. This Work will be paid for at the Contract Unit Price each for VIDEO SYSTEM DETECTION CAMERA, VIDEO DETECTION PROCESSOR.

(CTE – 10/28/2004)

SIGN, MESSAGE, ELECTRICALLY ILLUMINATED, FIBER OPTIC, BRACKET MOUNTED

Description. This item consists of furnishing and installing a single faced, permanently illuminated, incandescent or fiber optic sign, bracket mounted on a street light or traffic signal pole, or on a traffic post at the location shown on the plans or as directed by the Engineer. The sign may be installed as a single unit or in combination with traffic or pedestrian signals. Specific installations and configurations are shown on BOE Standard Drawings 834 and 835.

General Requirements. Perform work in accordance with Sections 802 and 891 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials. The sign shall meet the requirements of BOE Material Specification 1518 for the particular sign specified. The mounting brackets shall meet BOE Material Specification 1495. The cable shall meet the applicable requirements of BOE Material Specification 1475.

Installation Requirements. Each sign shall be faced in the direction of the traffic it is intended to control. During construction and until the installation is placed in operation, the sign face shall be hooded. The hooding material shall be securely fastened so it will not be disturbed by inclement weather or wind. The sign shall be mounted using pole mounting brackets meeting BOE Material Specification 1495, banded to the pole with two strips of ¾ inch stainless steel banding 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 shall have a baked-on black finish. The mounting configuration connecting the sign to the mounting bracket shall consist of sections of 1½ inch conduit of precise lengths, as indicated on the standard drawing, to create the designated structure, connected with cross fittings per BOE Standard Drawing 741, as required.

When the sign is to be mounted on a square pole or flat surface, the bracket will be bolted to the flat pole or surface using a 3/8 inch drive stud where permissible or using a 3/8 inch stud in a tapped hole.

The bottom mounting bracket shall be accurately located to cover an opening 1 inch in diameter, for cable entrance, drilled into the pole or standard at a calculated height to position the bottom sign face at a standard height of fourteen feet and eight inches (14'-8"), or a height indicated on the plans. The opening shall be reamed or filed to remove all sharp edges or burrs which might damage cable during installation or through vibration when the sign is in operation.

The Contractor shall provide and install a length of flexible electrical cord meeting BOE Material Specification 1475, except that the cable shall be two-conductor. The cable shall be of sufficient length to extend without strain or stress from the sign head to the terminal strip in the junction box mounted on the pole. Both ends of the cable length shall 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 sign shall 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, BOE Drawing Number 12268-A.

Lamp Requirements. The Contractor shall supply and install one 25 watt, 120 volt incandescent lamp for each of the eight sockets in the sign.

Painting and Color. The sign housing, the pole mounting bracket, and the crosses are to be factory painted by the manufacturer with baked on enamel. Matte black shall be the color unless directed otherwise.

Method of Measurement. This Work will be measured as each fiber optic sign bracket mounted.

Basis of Payment. This Work will be paid for at the contract unit price each for SIGN, MESSAGE, ELECTRICALLY ILLUMINATED, FIBER OPTIC, BRACKET MOUNTED of the type specified.

(CTE – 10/26/2004)

SIGN, MESSAGE, ELECTRICALLY ILLUMINATED, FIBER OPTIC, MAST ARM MOUNTED

Description. This item consists of furnishing and installing a single faced, permanently illuminated, incandescent or fiber optic sign, mounted on a traffic signal mast arm at the location shown on the plans or as authorized by the Engineer. The sign may be installed as a single unit or in combination with traffic signals. Specific installations and configurations are shown on BOE Standard Drawings 834 and 835.

General Requirements. Perform work in accordance with Sections 802 and 891 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials. The sign shall meet the requirements of BOE Material Specification 1518 for the particular sign specified. The mounting bracket shall meet BOE Material Specification 1463. The cable shall meet the applicable requirements of BOE Material Specification 1475.

Installation Requirements. Each sign shall be faced in the direction of the traffic it is intended to control. During construction and until the installation is placed in operation, the sign face shall be hooded. The hooding material shall be securely fastened so it will not be disturbed by inclement weather or wind. The sign shall be mounted on the mast arm using mast arm mounting brackets meeting BOE Material Specification 1463, banded to the mast arm with 5/8" stainless steel banding secured with a stainless steel banding clip, as shown on BOE Standard Drawing 834. The banding and clips shall have a baked-on black finish. The bracket shall be placed over a 1" hole drilled into the mast arm for the installation of cable. The hole shall be drilled at the location indicated on the plans. The hole shall be reamed or filed to remove any sharp edges or burrs which might tend to damage cable during installation, or through vibration.

The Contractor shall provide and install a length of flexible electrical cord meeting BOE Material Specification 1475, except that the cable shall be two-conductor. The cable shall be of sufficient length to extend without strain or stress from the sign head to the terminal strip in the junction box mounted on the pole. Both ends of the cable length shall 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 sign shall enter the mast arm through the hole in the mast arm, whence it shall 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 at the terminal strip in the junction box in accordance with connector schematic, Bureau of Electricity Drawing Number 12268-A.

Lamp Requirements. The Contractor shall supply and install one 25 watt, 120 volt incandescent lamp for each of the eight sockets in the sign.

Painting and Color. The sign housing, the pole mounting bracket, and the crosses are to be factory painted by the manufacturer with baked on enamel. Matte black shall be the color unless directed otherwise.

Method of Measurement. This Work will be measured as each fiber optic sign mast arm mounted.

Basis of Payment. This Work will be paid for at the contract unit price each for SIGN, MESSAGE, ELECTRICALLY ILLUMINATED, FIBER OPTIC, MAST ARM MOUNTED of the type specified.

(CTE – 10/26/2004)

REMOVE EXISTING TRAFFIC SIGNAL EQUIPMENT

Description. This item consists of removing the existing traffic signal equipment including lighting mast arm, luminaires, and traffic signal cables at the intersections listed on the plans.

General Requirements. Perform work in accordance with Sections 800 and 1086 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Delivery to City. The traffic control items, except for traffic signal cable, are to be removed and remain the property of the City of Chicago. The Contractor shall deliver the 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 shall be removed

and become the property of the Contractor and shall be disposed of by him, outside the right-of-way, at his sole expense. The cost of cable removal shall be included in this item.

The Contractor shall provide three (3) final copies of State's form(s) GF-2, listing the quantities and type of equipment that is to remain the property of the City, including model and serial numbers where applicable. He shall also provide a copy of the Contract Plan, or special provisions, showing the quantities and type of equipment. The Contractor shall 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 in good condition.

Method of Measurement. Removal of existing traffic signal equipment will be counted as lump sum.

Basis of Payment. This Work will be paid for at the contract lump sum price for REMOVE EXISTING TRAFFIC SIGNAL EQUIPMENT.

(CTE – 10/15/2004)

REMOVE EXISTING HANDHOLE OR MANHOLE

Description. This item consists of breaking down an existing handhole or manhole and filling in the affected area to grade.

General Requirements. Perform work in accordance with Section 800 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

This Work shall consist of removing the frame and cover of an existing handhole or manhole, breaking down the handhole/manhole walls, removing large debris, and backfilling the hole with screenings or other approved material. Backfill shall be installed in 6 inch layers and tamped. If the handhole/manhole is in a parkway, the hole shall be filled level to the existing grade. The top six inches of fill shall be of an approved soil mixture. If the handhole/manhole is in sidewalk or in pavement, the sidewalk or pavement shall be restored under a different pay item. If the frame or cover is deemed re-useable by the Engineer, the frame and/or cover shall be delivered to the Bureau of Electricity at a location identified by the Engineer. Any debris, including the frame and cover shall be disposed of off-site in an approved manner. The Contractor shall pay for all disposal fees.

Method of Measurement. Each manhole/handhole removed will be counted as a unit for payment.

Basis of Payment. This Work will be paid for at the contract unit price per each for REMOVE EXISTING HANDHOLE OR MANHOLE.

(CTE – 10/15/2004)

REMOVE CONTROLLER FOUNDATION, TYPE A

Description. This item consists of removing a concrete foundation for a pedestal mounted traffic signal, a traffic controller, or a fire alarm cabinet, completely, or to a level two feet below the 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 shall be properly restored with dirt to the existing level.

If the foundation is in sidewalk, the sidewalk shall be restored under a different pay item and shall not be considered as part of this Work.

General Requirements. Perform work in accordance with Sections 800 and 842 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Method of Measurement. Each foundation that is removed and disposed of as indicated will be counted as a unit for payment.

Basis of Payment. This Work will be paid for at the contract unit price per each for REMOVE CONTROLLER FOUNDATION, TYPE A.

(CTE – 10/28/2004)

REMOVE TRAFFIC SIGNAL POLE FOUNDATION

Description. This item consists of removing a concrete foundation for a traffic signal pole to a level three feet below the grade, disposing of the debris off-site in an approved manner, backfilling the excavation with screenings or other approved backfill material, and reconstructing the surface area. If the foundation is in a parkway, the parkway shall be properly restored with soil to the existing level. If the foundation is in sidewalk, the sidewalk shall be restored to its original condition.

General Requirements. Perform work under this item in accordance with Sections 800 and 895.05 of IDOT's Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

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

Basis of Payment. This Work will be paid for at the contract unit price per each for REMOVE TRAFFIC SIGNAL POLE FOUNDATION.

(CTE – 10/26/2004)

REMOVE FOUNDATION FOR BASE MOUNTED CONTROLLER

Description. This item consists of removing a concrete foundation for a traffic signal controller, completely, or to a level two feet below the grade, disposing of the debris off-site in an approved manner, backfilling the excavation with screenings or other approved backfill material, and reconstructing the surface area. If the foundation is in a parkway, the parkway shall be properly restored with soil to the existing level. If the foundation is in sidewalk, the sidewalk shall be restored to its original condition.

General Requirements. Perform work in accordance with Sections 802 and 878 of the Standard Specifications, except as herein modified.

Basis of Payment. This work will be paid for at the contract unit price for REMOVE FOUNDATION FOR BASE MOUNTED CONTROLLER.

(CTE – 10/26/2004)

SPECIAL EXCAVATION AND REPLACEMENT FOR CONDUIT UNDER CTA TRACK

Description. This item consists of opening and restoring a section of existing pavement approximately eighteen inches (18") wide by eighteen feet (18') long which includes and encases street car rails attached to wooden ties, and excavating and backfilling a trench for the installation of conduit for electric cables. This operation shall be performed at the location indicated on the plans, or as directed by the Engineer with the direction of trench construction perpendicular to the CTA track line, and any single such trench shall be large enough for the placement of a minimum for four-four inch (4-4") conduit, if required, without additional pavement opening.

General Requirements. Perform work in accordance with Section 353 and 441 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials. Concrete shall meet the requirements of the Standard Specification for Class SI Concrete.

Method of Construction. The size of the areas to be worked precludes the use of large machinery, permitting generally the use of a hand operated pneumatic (jack) hammer, a machine operated hydraulic bull point, or a concrete saw, with manual labor or a small back-hoe to load the broken concrete into a high-lift bucket or a dump truck for removal and off-site disposal of the spoil.

To maintain necessary lanes open to traffic, work should proceed in one lane at a time where possible. The use of a steel plate to cover cleared work areas shall be used to permit immediate resumption of vehicular traffic.

The concrete section of CTA roadbed containing rails and ties is approximately seventeen inches (17") thick and shall be removed to excavate the subgrade thereby requiring destructive removal of crossties which will not be replaced. Care shall be exercised to avoid cutting the CTA stranded copper ground drain cable which may or may not exist beneath the concrete. When this cable is cut, it shall be repaired to the satisfaction of the Engineer. Care shall be exercised to avoid damaging CTA conduit located midway between the sets of rails. The rails shall not be cut.

The trench under the rail section shall be excavated to a depth to provide thirty inches (30") cover over the conduit which will be installed and connected to conduit extending from foundations, manholes, or handholes as shown on the plans.

The trench shall be backfilled with sand for a depth of one foot and with other suitable fill to the bottom of the rails and compacted either by a mechanical or hand tamper meeting the approval of the Engineer.

The use of temporary steel plates to protect new concrete replacement shall be used to eliminate closing the roadway while the concrete cures.

Method of Measurement. This Work will be measured for payment in feet.

Basis of Payment. This Work will be paid for at the Contract Unit Price per lineal foot for SPECIAL EXCAVATION AND REPLACEMENT FOR CONDUIT UNDER CTA TRACK. Trenching and backfilling beneath the rails and temporary steel plates are also included in this pay item. The installation of the conduit will not be considered a part of this Work but will be paid for under a different unit cost schedule.

(CTE – 10/28/2004)

BUREAU OF ELECTRICITY SPECIFICATIONS

Specification No:

- 1368 - LUMINAIRE: WITH BUILT-IN BALLAST:FOR VERTICAL BURNING 310 WATT HIGH PRESSURE SODIUM VAPOR LAMP WITH TYPE II/TYPE III LIGHT DISTRIBUTION
- 1407 - POLE MOUNTED CAST ALUMINUM BOXES FOR TRAFFIC SIGNALS AND FIRE ALARM TERMINALS
- 1428 - THERMAL MAGNETIC CIRCUIT BREAKER
- 1440 - CABLE: SINGLE-CONDUCTOR, COPPER 600 VOLT ETHYLENE PROPYLENE INSULATION AND A HYPALON JACKET
- 1443 - SECONDARY RACK, 2 OR 3 WIRE, WITH INSULATORS
- 1447 - POLE: ANCHOR BASE, 3 AND 7 GAUGE, TAPERED TUBULAR STEEL, WITH HANDHOLE ENTRY
- 1450 - MAST ARMS: 4-, 8-, 12-, AND 15-FOOT: STEEL
- 1457 - SERVICE ENTRANCE, THREE CONDUCTOR, 600 VOLT, EPR INSULATED WITH HYPALON SHEATH OVERALL
- 1462 - RIGID STEEL CONDUIT (HOT DIPPED GALVANIZED)
- 1463 - TRAFFIC SIGNAL MOUNTING BRACKETS FOR MONOTUBE ARMS
- 1465 - GROUND RODS
- 1467 - ROD: ANCHOR, STEEL, WITH HARDWARE
- 1469 - TRAFFIC SIGNAL CONTROLLER AND CABINET LOCAL AND MASTER TYPES
- 1474 - CABLE: MULTIPLE CONDUCTOR, COPPER WIRE, 600 VOLT, ETHYLENE PROPYLENE RUBBER INSULATION, HYPALON JACKET
- 1475 - CORD: EIGHT CONDUCTOR NO. 16AWG., 600 VOLT 125 DEGREE C EPR INSULATION AND 105 DEGREE C JACKET
- 1482 - CABLE: TELECOMMUNICATIONS HYBRID FIBER OPTIC
- 1493 - TRAFFIC SIGNAL: VEHICULAR, TWELVE-INCH SINGLE FACE, SINGLE OR MULTIPLE-SECTION, POLYCARBONATE, LED OR INCANDESCENT
- 1494 - PEDESTRIAN TRAFFIC SIGNAL, 16 INCH WITH SYMBOLIC LED WALK/DON'T WALK LENSES POLYCARBONATE HOUSING
- 1495 - TRAFFIC SIGNAL MOUNTING BRACKET POLYCARBONATE, SIDE OF POLE
- 1496 - TRAFFIC SIGNAL: OPTICALLY PROGRAMMED, TWELVE-INCH SINGLE FACE, SINGLE OR MULTIPLE-SECTION
- 1518 - INTERNALLY ILLUMINATED SIGN

SPECIFICATION 1368
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
FEBRUARY 11, 1976

LUMINAIRE: WITH BUILT-IN BALLAST:FOR VERTICAL BURNING 310 WATT HIGH
PRESSURE SODIUM VAPOR LAMPWITH TYPE II/TYPE III LIGHT DISTRIBUTION

INTENT

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.

GENERAL

- (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.

DETAILED REQUIREMENTS

- (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 fourteen (14) business days after the bid opening, upon request of the Commissioner. 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 must not contain the lamp. 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 Contractor must warrant every luminaire against defects due to design, workmanship, or material developing within a period of eighteen (18) months 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 Contractor 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 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.
- (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 bked 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

- (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 20oF. 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 100o 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

- (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:

	<u>Type II Distribution</u>	<u>Type III Distribution</u>
No. of Luminaires (Contributing)	2	4
Spacing	85'- 1 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'

- (f) 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°.

**SPECIFICATION 1407
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
MARCH 15, 1995**

**POLE MOUNTED CAST ALUMINUM BOXES FOR TRAFFIC
SIGNALS AND FIRE ALARM TERMINALS**

SCOPE

This specification states the requirements for pole mounted, cast aluminum junction boxes to be used as enclosures for traffic signal and fire alarm multiple cable terminals.

GENERAL

- (a) Specifications. The junction boxes 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 Materials cited by ASTM Designation Number, of which the most recently published revisions will govern.
- (b) Drawings. The drawing mentioned herein is a drawing of the Department of Streets and Sanitation, Bureau of Electricity, and will be interpreted as part of these specifications.
- (c) Acceptance. Junction boxes not conforming to this specification will not be accepted.
- (d) Sample. One complete junction box of the manufacture intended to be furnished must be submitted within fourteen (14) business days after request by the Department of Streets and Sanitation, Bureau of Electricity. If the bidder supplying the sample is awarded a contract, the referenced sample will be credited as part of the order if it meets all requirements of this specification.
- (e) Workmanship. All junction boxes must be free of casting flaws and must have neat, smooth exterior surfaces. All holes must be accurately located and drilled to ensure interchangeability of all components.

DESIGN

- (a) Drawing. The junction box must conform in detail to the dimensions and requirements shown on drawing number 832.
- (b) Material. The body door and plate must be castings of non-heat treated aluminum silicon alloy conforming to ANSI alloy 443.0 of ASTM B26.

DETAIL REQUIREMENTS

- (a) **Assembly.** Each junction box must consist of the body, door with its gasket, flat plate with its gasket, terminal block mounting bracket and bottom gasket with its stainless steel hardware furnished as described below, all completely assembled, painted and ready for installation.
- (b) **Body.** The body must be cast as shown in drawing number 832. The top and bottom sides of the box where flat plates, or other fittings, will be attached, must be identically cast, machined flat, and drilled and tapped in accordance with dimensions shown. All fittings which fit on the top side must fit on the bottom side.
- (c) **Door.** The door must be cast as shown in drawing number 832. The door must be hinged at the left with stainless steel hinge pins and must open not less than 180 degrees to permit complete access to interior of the junction box. Two stainless steel Allen head machine screws, undercut and held captive, must hold the door closed and maintain positive pressure against a sponge neoprene gasket cemented in place completely around the door jamb. The door must be finished and painted prior to cementing the gasket into its groove in the door.
- (d) **End Plate.** A flat end plate must be furnished with each body casting. The plate must be drilled to align with tapped holes in the body casting and have a flush match with the periphery of the top and bottom body casting pads. The plate must have a properly fitted gasket and be held in place by four (4) stainless steel machine screws.
- (e) **Mounting Bracket.** A terminal block mounting bracket, as shown on drawing number 832, must be furnished and installed in each junction box. The bracket must be cast from ANSI alloy 443.0 per ASTM B26.
- (f) **Gaskets.** The gasketing between the body and the door must be of sponge neoprene and must be cemented in place after painting of the door. A cork gasket, 1/8 inch thick, must be used between the end plate and the body of the junction box on the top end and held in place by four (4) stainless steel screws. An identical cork gasket and four (4) stainless steel screws must be placed in a 6" x 4" metal fold kraft envelope, 32 sub., and placed within the box before shipping. This gasket with its screws will be used with the fitting used on the bottom end of the box.
- (g) **Hardware.** The hinge pins and all screws required for assembly of this junction box must be of stainless steel.
- (h) **Painting.** The exterior surfaces of the junction box must be properly cleaned and given one (1) coat of zinc chromate primer containing ten percent (10%) iron oxide and one (1) coat of green enamel. The color of the enamel must be green number 14110 of Federal Standard number 595. The primer and enamel must be of an approved grade and quality.

- (i) Packing. After the paint is thoroughly dry, and the junction boxes have been assembled, they must be suitably packed to prevent damage to painted surfaces during shipping and handling. All shipments must be fastened to, and shipped on, 48" x 48" hardwood, 4 way, non-returnable pallets. Total height must not exceed 64" and total weight must not exceed 2,000 pounds.

INSPECTION

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

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1428
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
SEPTEMBER 11, 1989**

THERMAL MAGNETIC CIRCUIT BREAKER

SUBJECT

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

GENERAL REQUIREMENTS

2. (a) Sample. One complete circuit breaker of each type and size, and of the manufacture intended to be furnished must be submitted upon request of the Commissioner within fourteen (14) business days after the bid opening date. If the contractor supplying the sample(s) delivered is awarded the contract, the sample(s) will be credited as part of the order. 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. Circuit breakers furnished under this specification must consist of the following types and sizes:
 - (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 insulating 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 677, 678 and 865.
- (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.

GUARANTEE

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

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1440
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
JANUARY 10, 1991**

**CABLE: SINGLE-CONDUCTOR, COPPER 600 VOLT ETHYLENE
PROPYLENE INSULATION AND A HYPALON JACKET**

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 either be installed in underground ducts or directly buried.

GENERAL

2. (a) Specifications. The cable shall 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-68-516
 2. IEEE Standard 383-1974
 3. ANSI-ASTM Standard E662-79
 4. ASTM Standard D-470-81
 5. U.L. 44
 6. U.L. 854
- (b) Acceptance. Cable not in accordance with this specification will not be accepted.
- (c) Reels. The cable shall be shipped on non-returnable reels. Reels shall be packaged with cardboard or other suitable material to prevent damage during shipping.
- (d) Warranty. The manufacturer shall 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 shall replace any cable failing during normal and proper use within two years of date of installation. All replacements under this warranty shall be made free of charge F.O.B. delivery point of the original contract. Lengths of cable having been replaced shall become the property of, and shall be returned to, the manufacturer F.O.B., City of Chicago.

CONSTRUCTION

3. This cable shall consist of a round copper conductor with a tight fitting, free stripping, concentric layer of Ethylene Propylene insulation and a concentric Hypalon jacket extruded in tandem with, and bonded to, the insulation. The cable shall be rated for continuous duty at 90 degree C operating temperature, 130 degree C emergency overload temperature and 250 degree C short circuit temperature.

CONDUCTOR

4. (a) Material. The conductor shall either be soft or annealed round copper wire.
- (b) Specifications. The conductor shall meet the requirements of ASTM B3, B8 or B258, as applicable.
- (c) Sizes. The conductor size shall be as stated in the PROPOSAL and in accordance with all requirements in Table A of this specification.
- (d) Stranding. The number of strands, shall be as indicted in Table A. Stranding shall meet the requirements of ASTM B8, Class B.

INSULATION

5. (a) Type. The insulation shall be Ethylene Propylene compound meeting the physical and electrical requirements specified herein.
- (b) Thickness. The insulation shall be circular in cross-section, concentric to the conductor, and shall 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 1,200
 2. Elongation at rupture, minimum percent 250
- (d) Air Oven Exposure Test. After conditioning in an air oven at 121 + 1°C for 168 hours using methods of test described in ASTM-D 573:
 1. Tensile strength, minimum percent of unaged value 75
 2. Elongation at rupture, minimum percent of unaged value 75
- (e) Mechanical Water Absorption:

Gravimetric Method. After 168 hours in water at 70+ 1°C:

 1. Water absorption, maximum, milligrams per square inch 5.0

- (f) Cold Bend Test Requirements. The completed cable shall pass the "Cold-Bend, Long-Time Voltage Test on Short Specimens" of ASTM D-470 except that the test temperature shall be minus (-) 25°C.
- (g) Electrical Requirements:
 - 1. Voltage Test. The completed cable shall meet an A.C. and D.C. voltage test in accordance with ASTM D-470 and D-2655.
 - 2. Insulation Resistance. The completed cable shall have an insulation resistance constant of not less than 20,000 when tested in accordance with methods shown in ASTM D-470.

JACKET

- 6. (a) Type. The jacket shall be a Hypalon (Chlorosulfonated Polyethylene) compound meeting the physical and electrical requirements specified herein.
- (b) Thickness. The jacket shall be circular in cross-section, concentric with the insulation, shall 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 shall 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, shall apply. All tests shall 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 shall 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 shall be conducted on samples taken every 25,000 feet or fraction thereof of each conductor size. In no case shall 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 shall be witnessed by an engineer from the Bureau of Electricity. In addition to these tests, the engineer shall also witness tests on completed cables for approximately five percent (5%) of the cable. 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 by the engineer. The contractor shall include in his bid, the cost of travel, food and lodging for one (1) engineer. Travel for 150 miles or greater shall utilize a major airline. Lodging accommodations shall be equal to those provided at a Holiday Inn. The engineer shall be given ten (10) working day 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. Where the cable fails to conform to any of the tests specified herein, the following shall apply:
1. Insulation or Jacket Tests. Samples shall be taken from each reel and shall successfully conform to all tests specified herein. Reels from which samples fail to conform, will be rejected.
 2. Completed Cable (Reel) Tests. Any reel which fails to conform to testing will be rejected. Where a reel fails during witness testing, the engineer will select five (5) additional reels to witness test.
 3. Where five percent (5%) or more of the reels are rejected for any reason, the entire cable order will be rejected.

PACKAGING

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

1/c No. (conductor size) AWG-600V-90°C-EP/Hypalon

The legend shall be repeated at approximately eighteen (18) inch intervals on the outside surface of the cable parallel to the longitudinal axis of the conductor. A sequential footage marking shall be located on the opposite side from the legend.

- (b) When three conductors (3/C) are specified, the smaller of the conductors shall have a green colored jacket and the three conductors shall be triplexed with a 16"-18" lay. The jacket color shall not be unduly affected by cable installation, or prolonged exposure to either direct sunlight or moisture. Where the quantity of 3/C cable exceeds 80,000 feet, witness testing as outlined in section 7(c) shall apply.
- (c) Reels. The completed cable shall be delivered on sound substantial, non-returnable reels. Both ends of each length of cable shall be properly sealed against the entrance of moisture and other foreign matter by the use of clamp-on cable caps, such as the Reliable Electric Company neoprene cable cap No. 1405, or equal. The ends shall be securely fastened so as not to become loose in transit. Before shipment, all reels shall be wrapped with cardboard or other approved wrapping.
- (d) Footage. Each reel shall contain the length of cable as set forth in Table A of this specification. A tolerance limit of plus or minus five percent (+5%) shall be adhered to.
- (e) Reel Marking. A metal tag shall 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 shall 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 SIZE	STRANDING	INSULATION THICKNESS	JACKET THICKNESS	A-C TEST VOLTAGE	REEL LENGTH
AWG OR MCM	NO. OF STRANDS	MILS	MILS	VOLTS	FEET
8	7	45	15	5,500	2,000
6	7	45	30	5,500	2,000
4	7	45	30	5,500	2,000
2	7	45	30	5,500	1,000
0	19	55	45	7,000	1,000
00	19	55	45	7,000	1,000
000	19	55	45	7,000	1,000
0000	19	55	45	7,000	1,000
250	37	65	65	8,000	1,000

THIS SPECIFICATION SHALL NOT BE ALTERED

**SPECIFICATION 1443
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
MAY 13, 1991**

SECONDARY RACK, 2 OR 3 WIRE, WITH INSULATORS

SUBJECT

1. This specification covers the requirements for 2 and 3 wire secondary racks complete with insulators for attachment to street lighting poles for the purpose of supporting aerial circuit wires.

GENERAL

2. (a) Specifications. Each 2 or 3 wire secondary rack shall conform in detail to the requirements herein stated, and to the specifications of the American Society for Testing Materials, cited by A.S.T.M. Designation number, of which the most recently published revision shall govern. Secondary racks not conforming to this specification will not be accepted.
- (b) Sample. If requested, each bidder shall submit with his proposal one complete sample secondary rack with insulators for approval by the Commissioner. The approved sample will be credited as part of the order.
- (c) Guarantee. Secondary rack and pole clamps furnished under this specification must be guaranteed against failure from defects due to materials or workmanship for a period of one year after delivery.

SECONDARY RACK

3. (a) General Design. The secondary rack shall be the medium duty type with extended back. It shall be suitable for either 2 or 3 wire, as indicated in the bid proposal, with 8-inch spacing between centers of the clevises. Secondary racks furnished under this specification shall be similar and the approval equal of Joslyn Mfg. and Supply Co. part number J767 for a two-wire rack and J768 for a three-wire rack.
- (b) Back Section. The back section of the secondary rack shall be made from C1010, hot rolled carbon steel strip of 1/8 inch thick; the steel to conform with ASTM Specification A 107. The back shall be formed to the shape of an inverted trough, the flat portion of which shall be approximately 1-1/4 inches in width. Mounting slots, 11/16 inch by 1-1/4 inch, shall be longitudinally centered on the flat of the back section and located so as to coincide with the centers of the clevises, with additional slots provided at the top and bottom.

- (c) Clevises. Clevises shall be made from 1/8 inches thick steel strip of the same material as the back section, and so formed to fit the back snugly. The prongs of the clevis shall be approximately 4 inches apart and formed to the shape of an inverted trough, the flat portion of which shall be approximately 3/4 inch in width with the edges pitched at an angle of 30° with the flat portion. Each clevis shall be fabricated in such a manner that the pitched edges of both prongs shall slope in the same direction. The clevises shall be riveted to the back section with two (2) 5/16 inch steel rivets.
- (d) Rack Bolt. The rack bolt shall be a 9/16 inch diameter button head bolt of C1040 steel conforming with the requirements of ASTM Specification A 107, complete with a 1/4 inch by 2 inch brass cotter pin at the bottom end. Centerline of the rack bolt shall be located 4 inches out from the face of the back section.
- (e) Spool Insulators. Spool insulators shall be dry processed porcelain insulators similar to and the approved equal of Joslyn Mfg. and Supply Company No. J101 spool insulator.

FINISH

- 4. After fabrication, the secondary rack and all hardware shall be hot dip galvanized overall in accordance with the requirements of ASTM specification A-155.

TESTS

- 5. At the discretion of the Commissioner, secondary racks furnished under this specification shall be subject to determine compliance with the strength requirements of ANSI medium type secondary racks.

INSPECTION

- 6. An inspector representing the City shall have free entry at all times while work under this specification is being performed, to all parts of the manufacturer's plant which shall concern the manufacture of these secondary racks. The manufacturer shall afford the inspector, without charge, all reasonable facilities to satisfy him that the secondary racks are being furnished in accord with these specifications. The final inspection shall be made at point of delivery. Any secondary rack rejected or found defective because of material deficiency or workmanship shall be removed and disposed of by the contractor at his sole cost.

THIS SPECIFICATION SHALL NOT BE ALTERED

**SPECIFICATION 1447
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
REVISED OCTOBER 3, 2001**

**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 City, one completely assembled anchor-base pole of the manufacture intended to be furnished, must be submitted for review by the Commissioner within 14 working days of receiving Notice-to-Proceed.

- (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 three 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. The completed, unpainted masts must have smooth external surfaces free from protuberances, dents, cracks or other imperfections marring their appearance. Each mast must be straight and centered on its longitudinal axis.

- (d) Base. The mast base must be a 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 non-metallic screws or another type of non-seizing fastener, as approved by the Commissioner. The covers must enclose the anchor bolts and be secured in an approved manner. 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 to accept a 1/4" 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. Steel spring clips must be mounted to the tabs. These clips must be made to accept 1/4"- 20 machine screws. The 1/4"-20 allen head machine screws must have a button head. The screws must have a stainless steel core within a threaded nylon body. Other non-seizing types of screws and fasteners 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 non-metallic material subject to approval of the Commissioner. It must fit the doorframe closely and be dished so that it will stay in proper position even if its locking screws must be slightly loosened. The door must be drilled top and bottom to accept the 1/4"-20 Allen head machine screws which will fasten the door to the doorframe. All doors must be interchangeable. Alternate methods 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, 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. All welds of five percent (5%) of the poles in every lot must be inspected for penetration and soundness of the welds by the magnetic particle inspection method or by radiography. Acceptance or rejection will be governed by the same conditions as in 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) Exterior Coat. A thermosetting, weathering, 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 six (6) inches. 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%) Na Cl (by weight) solution at 95°F and 95% relative humidity without blistering. Before test, the panel must be scribed with an "X" down to bare metal.
- (h) Coating Measurement. Measurement of coating thickness must be done in accordance with SSPC-Pa 2-73T, "Measurement of Dry Paint Thickness with Magnetic Gauges," except that the lowest "single spot measurement" in an area of two square inches must be not less than 7.0 mils.
- (i) Color. Color must be gloss black unless otherwise noted in the order. A color sample must be submitted for approval prior to fabrication.

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. A record of every test must be made and a certified copy of the test record must be submitted to the Purchasing Agent before the masts are shipped. An engineer from the Bureau of Electricity, Engineering Division, must be present during the testing procedures, if so requested by the City.
- (b) Lot. Tests for deflection and set of the mast and of the mast arm supports must be made upon five (5%) percent of all the masts in every lot (two (2) min.). The selection of masts for testing must be random from the entire completed lot. If any of the masts in any lot fail to meet the test, an additional three (3%) percent of the masts of the same lot must be tested (two (2) min.). If any of these masts fail to meet the test requirements, the entire lot will be subject to rejection, except that the manufacturer may subject each mast in the lot to the test, and those which fulfill the requirement will be accepted. After testing, each base weld must be inspected by 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.

THIS SPECIFICATION MUST NOT BE ALTERED

TABLE A

POLE	GAUGE	BOLT CIRCLE	ANCHOR ROD	BASE PLATE	TEST LOAD	MAX. DEF.	MAX. SET	DRAWING
7.67"x12.5"x 34'6"	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"x 34'6"	3	15.0"	1.25"	1.5"	2000#	30"	2.5"	808
5.17"x10.0"x 34'6"	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

**SPECIFICATION 1450
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
REVISED SEPTEMBER 25, 2001**

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 14 business days upon request of the Commissioner.
- (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 654.
- (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. Five (5) percent of the mast arms of each size in every order must be tested for integrity of the welds.
- (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) percent of the mast 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 will be present during the testing procedures, if so requested by the City. The contractor must include in his bid, the cost of travel, food and lodging for one (1) engineer. Travel for 150 miles or greater must utilize a major airline. Lodging accommodations must be equal to those provided at a Holiday Inn. The engineer must be given ten (10) working days notice of travel arrangements.

PACKAGING

8. (a) General. The arms must be shipped in bundles. Each arm must be individually wrapped so that the arm can be bundled for shipping and unbundled for delivery without damage to the arm or its finish. Materials such as lumber (2"x4" min.), non-marring banding, and other appropriate bundling materials must be used to make a rigid, long lasting, bundle capable of being handled, shipped and stored without shifting or breaking of the contents. Any bundles, in which either the mast arms or packaging is received broken, damaged or with contents shifted, will not be accepted and it will be the responsibility of the supplier to return the bundle at no cost to the City. Each bundle must be capable of being lifted by a fork lift truck or crane and the bundles must be shipped in a flat bed truck to facilitate unloading. Each arm wrapping must be clearly labeled indicating the arm size, i.e. 8' STEEL LUMINAIRE MAST ARM.
- (b) The hardware must be shipped with each bundle. The package must be labeled and placed in a prominent position to facilitate accessibility, and must be attached to, or within, the bundle in such a manner as to assure safe delivery.
- (c) All mast arms will be delivered to the Bureau of Electricity storage yard at 4101 South Cicero Avenue in Chicago, or to another location within the City as indicated on the order.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1457
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
APRIL 23, 1992**

**CABLE: SERVICE ENTRANCE, THREE CONDUCTOR,
600 VOLT, EPR INSULATED WITH
HYPALON SHEATH OVERALL**

SUBJECT

1. This specification states the requirements for three conductor Ethylene Propylene Rubber (EPR) insulated, hypalon sheathed cable for installation on Commonwealth Edison service poles for the purpose of providing secondary feeds for Municipal street lighting 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-68-516
 - (2) IEEE Standard 383-1974
 - (3) ANSI-ASTM Standard E662-79
 - (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) Guarantee. The manufacturer must guarantee the cable to be first class material throughout. Notwithstanding other claims against them, if the cable be installed within one year of date of shipment, the manufacturer must replace any cable failing during normal and proper use within two years of installation. All replacements under this warranty must be made free of charge F.O.B. delivery point of the original contract. Lengths of cable having been replaced will become the property of and must be returned to the manufacturer F.O.B. City of Chicago.

CABLE

- 3. (a) Construction. This cable must consist of three (3) conductors separately insulated and color coded. Suitable fillers must be used to produce essentially 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-68-516. A binder tape must be used over the cabled conductor assembly and a hypalon sheath 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.
- (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, 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.

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 45 mils (.045") for both #4 AWG & #2 AWG and 55 mils (.055") for 1/o 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 a Hypalon (chlorosulfonated Polyethylene) compound meeting the physical and electrical requirements specified herein.
- (b) Thickness. The jacket must be circular in cross-section, concentric with the insulation, must have an average thickness not less than 80 mils (.080") 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 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 5,000 feet or fraction thereof of each conductor size. In no case must less than two (2) samples be taken.
- (c) Witness Tests. Where the quantity of cable on a single purchase order is 7,500 feet or more, all insulation and jacket tests must be witnessed by an engineer from the Bureau of Electricity. In addition to these tests, the engineer must also witness tests on completed cables for approximately five percent (5%) of the cable. 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 by the engineer. 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. Where the cable fails to conform to any of the tests specified herein, the following must apply:
 - (1) Insulation or Jacket Tests. Samples must be taken from each reel and must successfully conform to all tests specified herein. Reels from which samples fail to conform, will be rejected.
 - (2) Completed Cable (Reel) Tests. Any reel which fails to conform to testing will be rejected. Where a reel fails during witness testing, the engineer will select two (2) additional reels to witness test.
 - (3) Where two (2) or more of the reels are rejected for any reason, the entire cable order will be rejected.

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-EP/Hypalon 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, 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.
- (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/o 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.

THIS SPECIFICATION MUST NOT BE ALTERED

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)	Commodity Code
8	750	7	4.5	1500	55	80	6078
4	950	7	4.5	1000	55	80	6074
2	1100	7	4.5	1000	65	80	6072
1/0	1400	19	5.5	500	80	95	6070

* First six digits of Commodity Code Number for all sizes: 31-4686

**SPECIFICATION 1462
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
AUGUST 7, 1992**

**RIGID STEEL CONDUIT
(HOT DIPPED GALVANIZED)**

1. SCOPE

This specification describes rigid steel conduit, zinc coated.

2. GENERAL REQUIREMENTS

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.

3. STANDARDS

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 244. 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.

4. STEEL

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.

5. THREADING AND CHAMFERING

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.

6. ZINC COATING

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.

7. COUPLINGS

Couplings must comply with the following requirements:

- (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 ½ inch and larger sizes may be taper-tapped.

8. PACKING AND IDENTIFICATION

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.

9. TEST AND INSPECTION

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 ½ 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 ½ inches.

Tests on sizes other than ½ inch may be conducted within one year after the time of manufacture. If such tests are conducted, the conduit must be bent into a quarter of a circle around a mandrel, the radius of which is six times the nominal size of the conduit.

One of the following three test methods must be employed for measuring the thickness or extent of the external zinc coating on conduit:

- (a) Magnetic test.
- (b) Dropping test.
- (c) Preece test (Material which will withstand four 1-minute immersions will be considered as meeting requirements as follows; the zinc content of the coating on the outside surface must be equivalent to a minimum thickness of 3.4 mils).

All tests and inspections must be made at the place of manufacture prior to shipment unless otherwise specified, and must be so conducted as not to interfere with normal manufacturing processes.

Each length of conduit must be examined visually both on the outside and inside to determine if the product is free from slivers, burrs, scale or other similar injurious defects (or a combination thereof), and if coverage of the coating is complete.

If any samples of rigid steel conduit tested as prescribed in this specification should fail, two additional samples must be tested, both of which must comply with the requirements of the specification.

All pipe which may develop any defect under tests, or which may before testing or on delivery be found defective, or not in accordance with these specifications, must be removed by the Contractor at his own expense; and such pipe so removed by the Contractor must be replaced by him within ten (10) days of such rejection with other pipe which will conform to these specifications.

TABLE 1

Design Dimension and Weights of Rigid Steel Conduit

Nominal or Trade Size of Conduit	Inside Diameter	Outside Diameter	Wall Thickness	Length Without Coupling	Minimum Weight of Ten Unit Lengths With Couplings
<u>(Inches)</u>	<u>(Inches)</u>	<u>(Inches)</u>	<u>(Inches)</u>	<u>(Feet & Inches)</u>	<u>(Pounds)</u>
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 percent for the 2-inch and larger sizes.

Wall thickness: - 12 1/2 percent

TABLE 2

Dimensions of Threads

Nominal or Trade Size of Conduit (Inches)	Threads per Inch	Pitch Diameter at end of Thread (Inches) Tapered 3/4 Inch per foot	Length of Thread (Inches)	
			Effective L2	Overall L4
1/2	14	0.7584	0.53	0.78
3/4	14	0.9677	0.55	0.79
1	11 1/2	1.2136	0.68	0.98
1 1/4	11 1/2	1.5571	0.71	1.01
1 1/2	11 1/2	1.7961	0.72	1.03
2	11 1/2	2.2690	0.76	1.06
2 1/2	8	2.7195	1.14	1.57
3	8	3.3406	1.20	1.63
3 1/2	8	3.8375	1.25	1.68
4	8	4.3344	1.30	1.73

NOTE: The applicable tolerances are:

Threaded Length (L₄ Col 5): Plus or minus one thread

Pitch Diameter (Col 3): Plus or minus one turn is the maximum variation permitted from the gaging face of the working thread gages. This is equivalent to plus or minus one and one half turns from basic dimensions, since a variation of plus or minus one half turn from basic dimensions is permitted in working gages.

TABLE 3

Designed Dimensions and Weights of Couplings

Nominal or Trade Size of Conduit <u>(INCHES)</u>	Outside Diameter <u>(INCHES)</u>	Minimum Length <u>(INCHES)</u>	Minimum Weight <u>(POUNDS)</u>
1/2	1.010	1-9/16	0.115
3/4	1.250	1-5/8	0.170
1	1.525	2	0.300
1 1/4	1.869	2-1/16	0.370
1 1/2	2.155	2-1/16	0.515
2	2.650	2 1/8	0.671
2 1/2	3.250	3-1/8	1.675
3	3.870	3-1/4	2.085
3 1/2	4.500	3-3/8	2.400
4	4.875	3-1/2	2.839

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1463
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
REVISED JUNE 22, 2001**

**TRAFFIC SIGNAL MOUNTING BRACKETS FOR
MONOTUBE ARMS**

SUBJECT

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

- (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. One complete mounting bracket must be submitted within fourteen (14) business days upon request of the Commissioner. 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 monotube arms herein described, as demonstrated by a submittal list of comparable projects.

DESIGN

- (a) General. The mounting bracket must be designed such that no portion of the bracket is put into tension when it is attached to either the mast arm or to the signal support tube. All materials must be corrosion resistant and designed to be structurally sound.
- (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 3M optically programmed signal heads; and with signs.

- (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.
- (f) 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 1/2" diameter cable between the mast arm and the signal face.
- (g) Banding. Where banding is used to attach the mounting bracket to the mast arm, the banding must be 3/4" x 42" stainless steel.
- (h) Castings. Where castings are used for the brackets, they must be smooth and free of defects.

TESTING

- (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. All tests must 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

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.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1465
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
REVISED AUGUST 28, 1995**

GROUND RODS

SUBJECT

1. This specification states requirements for ground rods to be used for ground connections in street lighting, traffic signal, fire alarm, 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.

DESIGN

3. (a) Ground rods must be made of mild steel core suitable for driving into the earth without deformation.
- (b) A heavy, uniform covering of electrolytic copper must be metallically bonded to the steel core to provide a corrosion resistant, inseparable bond between the steel core and the copper overlay.
- (c) The rod must be processed to work harden the copper providing a scar resistant surface.
- (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 end.
- (f) All ground rods must be three-quarter inches (3/4") in diameter. The length must be as specified elsewhere. The length of the rod must be clearly and permanently marked near the top of the rod (chamfered end).
- (g) All ground rods must conform to U.L. 467 and must be listed as such.
- (h) All ground rods must be supplied with a Blackburn G6 clamp, or equivalent.

ACCEPTANCE

4. (a) The contractor must furnish one sample of the ground rod proposed to be furnished within fourteen business days from receipt of notice. The approved sample must be the standard, in all respects, to which all ground rods furnished must conform. The accepted ground rod will be credited as part of the order.
- (b) The sample ground rod must be delivered to the Engineer of Electricity, 2451 S. Ashland Avenue, Chicago, Illinois 60608.
- (c) Ground rods not accepted must be removed at the sole expense of the contractor.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1467
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
MAY 12, 1993**

ROD: ANCHOR, STEEL, WITH HARDWARE

SUBJECT

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

GENERAL

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

ANCHOR ROD

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

HARDWARE

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

FINISH

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

TESTS

6. At the discretion of the Commissioner, anchor rods and hardware furnished under this specification will be subject to testing to determine compliance with the materials physical requirements.

INSPECTION

7. Final inspection must be made at point of delivery. Any anchor rods and hardware rejected must be removed by the Contractor at his sole expense.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1469
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
REVISED JUNE 1, 2000**

**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 fourteen (14) 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 contractor 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 contractor 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 arrestor. The gas type arrestor 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.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1474
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
MARCH 15, 1995**

**CABLE: MULTIPLE CONDUCTOR, COPPER WIRE, 600 VOLT, ETHYLENE PROPYLENE
RUBBER INSULATION, HYPALON JACKET**

SUBJECT

This specification states the requirements for a multiple cable to be installed in underground conduits and uses to distribute electrical energy to operate automatic traffic control equipment at street intersections within the City of Chicago.

GENERAL

- (a) Specification. 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, in which the most recently published revision will govern.
- (b) Acceptance. Cable not conforming to this specification will not be accepted.
- (c) Reels. The cable must be shipped on non-returnable reels. No charge should be made for wood lagging.
- (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. Lengths of cable having been replaced will become the property of and must be returned to the manufacturer F.O.B. City of Chicago.

CABLES

- (a) Construction. 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 neoprene or hypalon 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 (inches)</u>
Seven	0.65
Ten	0.80
Fourteen	0.85
Nineteen	0.95
Twenty Two	1.10

- (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

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

- (a) Material. Round, soft or annealed, copper wire.
- (b) Size. Cables must be made up of conductor sizes as set forth in Table A above. The Number 6 AWG conductors must be seven (7) strand, and the Number 10 AWG conductors must be solid.

INSULATION

- (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
#6	7	2	45
#10	1	2	25
#12	1	7	25
#12	1	10	25
#12	1	14	25
#12	1	19	25
#12	1	22	25

- (c) Physical Properties. Initial Value.
Tensile Strength 1200 psi minimum
Elongation at Rupture.....250% minimum
- (d) Physical Properties. After Aging.
- (1) After 168 hours in air oven at 121 degrees C:
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.
- (1) 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 degrees C 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°C.
- (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

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

- (a) Material. The jacket must be heavy duty neoprene or hypalon (Chlorosulfonated Polyethylene) meeting the Physical and electrical requirements specified herein.
- (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 No. 4 AWG	5/64 inch
(2) Two-Conductor No. 6 AWG	5/64 inch
(3) Two-Conductor No. 10 AWG	4/64 inch
(4) Seven-Conductor	3/64 inch
(5) Ten-Conductor	4/64 inch
(6) Fourteen-Conductor	4/64 inch
(7) Nineteen-Conductor	4/64 inch
(8) Twenty-Two Conductor	5/64 inch
- (d) Initial Physical Requirements:
 - 1. Tensile strength minimum PSI..... 1800
 - 2. Elongation at rupture, minimum percent 300
- (e) Air Oven Exposure Test. After conditioning in an air oven at $121^{\circ} \pm 10^{\circ}$ 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 $70^{\circ} \pm 1^{\circ}$ C:
 - 1. Milligrams 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

- (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. In addition to these tests, the engineer must also witness tests on completed cables for approximately five percent (5%) of the cable. Included in these tests will be a 70,000 BTU per hour flame tests in accordance with IEEE 383. Reels to be tested will be selected a random by the engineer. 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. Where the cable fails to conform to any of the tests specified herein, the following must apply:
 - (1) Insulation or Jacket Tests. Samples must be taken from each reel and must successfully conform to all tests specified herein. Reels from which samples fail to conform, will be rejected.
 - (2) Completed Cable (Reel) Tests. Any reel which fails to conform to testing will be rejected. Where a reel fails during witness testing, the engineer will select five (5) additional reels to witness test.
 - (3) Where five percent (5%) or more of the reels are rejected for any reason, the entire cable order will be rejected.

PACKAGING

- (a) Reels. The completed cable must be delivered on sound substantial, nonreturnable reels. Both ends of each length of cable must be properly sealed against the entrance of moisture and other foreign matter by the use of clamp-on cable caps, such as the Reliable Electric Company neoprene cable cap No. 1405, or equal. The ends must be securely fastened so as not to become loose in transit. Before shipment, complete 2 x 4 lagging must be applied to all reels.
- (b) Footage. Each reel must contain the length of cable as set forth below. A tolerance limit of plus or minus five percent ($\pm 5\%$) must be adhered to.
 - (1) Two-Conductor 2000 feet
 - (2) Seven-Conductor 2000 feet
 - (3) Ten-Conductor 2000 feet
 - (4) Fourteen-Conductor 2000 feet
 - (5) Nineteen-Conductor 1000 feet
 - (6) Twenty-two 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) Two-Conductor No. 6 AWG	31-4686-5808
(3) Two-Conductor No. 10 AWG	31-4686-5510
(4) Seven-Conductor	31-4682-5620
(5) Ten-Conductor	31-4682-5630
(6) Fourteen-Conductor	31-4682-5640
(7) Nineteen-Conductor	31-4682-5645
(8) Twenty-two Conductor	31-4682-5650

TABLE A COLOR CODE CONDUCTOR IDENTIFICATION

Base Color	First Tracer	Second Tracer	2 (# 6)	2 (# 4)	7	10	14	19	22
White	Black	Red	--	--	--	--	--	12	12
White	Red	Green	--	--	--	--	--	12	12
Black	--	--	6	4	12	12	12	12	12
White	--	--	6	4	12	12	12	12	12
Red	--	--	--	--	12	12	12	12	12
Green	--	--	--	--	12	12	12	12	12
Orange	--	--	--	--	12	12	12	12	12
Blue	--	--	--	--	12	--	12	12	12
White	Black	--	--	--	12	--	--	--	12
Red	Black	--	--	--	--	12	12	12	12
Green	Black	--	--	--	12	12	12	12	12
Orange	Black	--	--	--	--	12	12	12	12
Blue	Black	--	--	--	--	12	--	--	--
Black	White	--	--	--	--	--	--	--	12
Red	White	--	--	--	--	--	12	12	12
Green	White	--	--	--	--	--	12	12	12

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1475
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
MARCH 15, 1995**

**CORD: EIGHT CONDUCTOR NO. 16AWG., 600 VOLT
125 DEGREE C EPR INSULATION AND 105 DEGREE C JACKET**

SUBJECT

1. This specification states the requirements for an eight (8) conductor number 16AWG, electrical cable, to be installed in conduit and used to electrically energize traffic signal faces at street intersections within the City of Chicago.

SCOPE

2. This specification sets forth construction details and test requirements of the cable to be furnished. 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

3. (a) SPECIFICATIONS. The cable must conform in detail to the requirements herein stated, and to the Specifications and Methods of Test of the American Society for Testing and Materials cited by ASTM Designation Number, the Underwriters Laboratories, Inc. Standard or Style number and any other recognized Standardization group's specifications referred to by the appropriate designation, of which the most recently published revision will govern.
- (b) ACCEPTANCE. Cable not conforming to this specification will not be accepted.
- (c) WARRANTY. The manufacturer must warrant the cable to be first class material throughout. In addition to any other claims against them, if the cable is installed within six months of date of shipment, the manufacturer must replace any cable failing during normal and proper use within two years of date of installation. All replacements under this warranty must be made free of charge F.O.B. delivery point of the original contract. Lengths of cable having been replaced will become the property of, and must be returned to, the manufacturer F.O.B., City of Chicago.

CABLE

4. (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

5. (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 125 degrees C CPE" 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

6. (a) **MATERIALS.** 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) or ASTM B-189 (lead or lead-alloy 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

7. (a) **TYPE.** The insulation must be an easily strippable ethylene propylene rubber compound meeting or exceeding the requirements of ICEA S-68-516 and the additional requirements of this specification.
- (b) **RATING.** The insulation must be rated for continuous duty at 125 degrees C in accordance with U.L. AWM Style 3400.
- (c) **THICKNESS.** The insulated conductor must be circular in cross-section, concentric to the conductor, with a nominal insulation thickness of 0.031 inches (2/64") and a minimum spot thickness of 90% of the nominal thickness.

(d) INITIAL PHYSICAL REQUIREMENTS:

1. Tensile strength, min., PSI..... 1,600
2. Elongation at rupture, min. % 250

(e) AIR OVEN EXPOSURE TEST. After conditioning in an air oven at 158 ± 1 degree C for 168 hours using methods of test described in ASTM-D 573:

- Tensile strength, minimum percent
of unaged value 85
- Elongation at rupture, minimum
Percent of unaged value 65

(f) MECHANICAL WATER ABSORPTION:

1. GRAVIMETRIC METHOD. After 168 hours in water at 70 ± 1 degree 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 degrees 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 $158 \text{ degrees C} \pm 1 \text{ degree C}$. 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

8. (a) TYPE. The jacket must be a thermosetting chlorinated polyethylene (CPE) compound meeting the physical and electrical requirements specified herein. In lieu of CPE, the contractor may supply a chlorosulfonated polyethylene (hypalon) compound meeting these requirements.

- (b) RATING. The jacket must be rated for continuous duty at 105 degrees C.
- (c) THICKNESS. The jacket must be circular in cross-section, concentric with the insulation, must have an average thickness not less than 45 mils and a spot thickness not less than ninety percent (90%) of the average thickness.
- (d) INITIAL PHYSICAL REQUIREMENTS:
 - 1. Tensile strength minimum PSI..... 1800
 - 2. Elongation at rupture, minimum percent..... 300
- (e) AIR OVEN EXPOSURE TEST. After conditioning in an air oven at 121 ± 1 degree C for 168 hours for hypalon or 136 ± 1 degree C for CPE:
 - 1. Tensile strength, minimum percent of unused value 75
 - 2. Elongation at rupture, minimum percent of unaged valued 55
- (f) MECHANICAL WATER ABSORPTION. After 168 hours at 70 ± 1 degree C:
 - 1. Milligrams per square inch, maximum 20

TESTING

- 9. (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. In addition to these tests, the engineer must also witness tests on completed cables for approximately five percent (5%) of the cable. Reels to be tested will be selected at random by the engineer. 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. Where the cable fails to conform to any of the tests specified herein, the following must apply:
 - 1. Insulation or Jacket Tests. Samples must be taken from each reel and must successfully conform to all tests specified herein. Reels from which samples fail to conform, will be rejected.
 - 2. Completed Cable (Reel) Tests. Any reel which fails to conform to testing will be rejected. Where a reel fails during witness testing, the engineer will select five (5) additional reels to witness test.
 - 3. Where five percent (5%) or more of the reels are rejected for any reason, the entire cable order will be rejected.

PACKAGING

- 10. (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.

SPECIFICATION 1482
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
MARCH 20, 1997

CABLE: TELECOMMUNICATIONS
HYBRID FIBER OPTIC

MATERIALS

1. (a) Hybrid fiber optic cable
The cable must meet, as a minimum, the following specifications and conform with the latest issue of Bellcore TR-TSY-00020: Generic requirement for Optical Fiber and Optical Fiber Cables, ANSI/EIA-472: Generic Specification of Fiber Optic Cables, and REA-PE-90; and appropriate Sectional Specifications thereof.
- (b) Cable Construction
Cable construction, other than as specified, must be approved by the ENGINEER.
 1. The cable must be constructed entirely from dielectric material.
 2. A cable suitable for either direct installation into a duct bank or conduit must be supplied.
 3. The cable must be of gel-filled, loose tube construction with up to 12 buffer tubes wrapped around a dielectric central strength member. All fiber(s) must be contained within buffer tubes, and each buffer tube must have an inside diameter much greater than the total diameter(s) of the fibers(s) it supports.
 4. Each fiber or group of fibers must be free-floating within the tubes such that all mechanically or environmentally induced stress placed upon the cable is de-coupled from the fibers. The air within the buffer tubes must be displaced with a gel to prevent entry by water and to facilitate free movement of the fibers(s) within.
 5. The buffer tubes must be color coded in compliance with EIA/TIA-598; Color Coding of Fiber Optic Cables.
 6. Cables constructed of less than six fibers must have a buffer tube provided for each fiber: cables constructed of more than six fibers may have several fibers occupy a buffer tube, with equal distribution of fibers as far as practicable. All fibers must be color coded in compliance with EIA/TIA-598: Color Coding of Fiber Optic Cables. Single-mode and multimode fibers must not occupy the same buffer tube.

7. In buffer tubes containing multiple fibers, the colors must be stable during temperature cycling and not subject to fading or smearing onto each other or into the gel filling material. Colors must not cause fibers to stick together.
8. The cable must have an interstitial filing between the buffer tubes and throughout the remainder of the cable to prevent entry of water.
9. A binder wrapping strength member of aramid fibers must be provided as a final layer prior to application of the outer jacket.
10. The cable must be provided in continuous lengths. Each fiber must be pulled from the same optical waveguide form and must be free of splices. Each optical fiber must consist of a doped silica core surrounded by a concentric silical cladding; the use of any other material must be approved by the CITY.
11. A permanent marking must be employed on the outer jacket of the cable which must show the date of manufacture and the manufacturer's name. A numerical sequence must be marked on the outer jacket, at intervals no greater than ten (10) feet to facilitate determination of length of cable and amount of cable remaining on the reel. The height of the marking must be 2.5 mm nominal.
12. All optical fibers must be 100% attenuation tested at the factory for compliance with performance specifications described herein. The attenuation of each fiber must be provided with each cable reel.
13. The outer jacket must be constructed of medium density polyethylene, minimum jacket thickness of 1.4 mm. Jacketing material must be applied directly over the tensile strength members and flooding compound. The outer jacket must be UV and fungus resistant.

(c) Single Mode Optical Specifications

Optical Wavelength	1,300nm and 1.550 nm
Optical Attenuation	@ 1,300 nm: 0.7 dB/km @ 20 C @ 1,550 nm: 0.6 dB/km @ 20 C
Optical Dispersion	@ 1,300 nm: 3.5-4.5 psec/nm-km @ 1,550 nm:(\leq) 20 psec/nm-km
Zero-Dispersion Wavelength	1300 to 1320 nm, nominal
Zero Dispersion Slope	\leq 0.092 ps/nm ² -km
Fiber Core Diameter	8.3 um, typical
Fiber Coating Diameter	250+/-10 um
Fiber Cladding Diameter	125+/-2 um
Core to Cladding Offset	\leq 1.8 um
Cladding Non-Circularity	\leq 1.0%
Spot Size	9.3+/-0.5 UM @ 1300 nm 10.5+/-1 UM @ 1550 nm
Cutoff Wavelength	\leq 1250 nm

(d) Multimode Optical Specifications

Operational Wavelength	850 nm and 1,300 nm
Optical Attenuation	
@850 nm:	400 MHZ-km @ 20 C
@ 1,300 nm:	400 MHZ-km @ 20 C
Fiber Core Diameter	62.5 um +/-3.0 um
Fiber Coating Diameter	250 +/-15 um
Fiber Cladding Diameter	125 +/-2.0 um
Core to Cladding offset	<=3.0 um
Cladding Non-Circularity	<=6.0%
Numerical Aperture	0.275+/0.015
Index	Graded Index

(e) Hybrid Cable Mechanical Specifications

Crush Resistance	5,000 N/m. length of cable
Cable Outside Diameter	0.50' nominal
Minimum Bending Radius:	
Installation	20 times the cable diameter
Static	10 times the cable diameter
Temperature:	
Installation	-30 C to + 70 C
Storage/Operation	-40 C to + 70 C
Humidity	0 to 100%
Tensil Strength:	
Installation	2,700 N (600 ibf)
Static	600 N (125 ibf)

FIBER OPTIC PIGTAILS

2. The optical pigtail provided under this Contract must consist of multiple fibers, factory connectorized on one end, suitable for installation in an outdoor duct run. Each fiber must be individually jacketed, with aramid yarn fibers between the fiber and the sub-jacket. The fibers must then be contained in a medium density polyethylene outer jacket. The multi-fiber pigtail must be provided in eight (8) multimode fibers/configuration.

The factory installed ST connectors furnished as part of pigtails must meet or exceed the requirements for approval connectors specified herein. There must be a S-T type connector installed on all eight (8) multi-mode Fiber Optic Pigtails will be determined on Sub-orders placed.

The cable must be suitable for installation in outdoor manholes with water and/or ice.

Each jacketed fiber must have a tensile strength in excess of 50 lbs.

**SPECIFICATION 1493
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
MARCH 20, 2000**

**TRAFFIC SIGNAL: VEHICULAR, TWELVE-INCH
SINGLE FACE, SINGLE OR MULTIPLE-SECTION,
POLYCARBONATE, LED OR INCANDESCENT**

1. GENERAL REQUIREMENTS

- 1.1 This specification states the requirements for twelve-inch, single face, single and multiple-section, traffic signals with polycarbonate housings, using LED or incandescent light source, for use in the traffic control system of the City of Chicago. Units include red ball, yellow ball, green ball, red arrow, yellow arrow, and green arrow.
- 1.2 Sample and Certified Test Reports. One complete signal, fully assembled and wired, of the manufacture proposed to be furnished, must be submitted along with the required certified test reports, within fourteen (14) working days upon request of the Commissioner. 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 Definitions. Where referenced in the specification, the following definitions will apply:
- 1.4.1 Approval. Approval will mean approval in writing by the Commissioner or his/her duly authorized representative.

2. MATERIALS AND EQUIPMENT REQUIREMENTS

- 2.1 The traffic signal heads must conform to ITE Standard "Vehicle Traffic Control Signal Heads" (VTCSH), in which the most recently published revisions 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 deg. F	ASTM D 1525
Brittleness temp.	Below-200 deg. 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.
- 2.2 The traffic signal heads must be provided with incandescent and/or LED optical units as specified in the PROPOSAL or Contract Plans.
- 2.2.1 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.

2.2.2 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.

2.3 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 Tracer	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 (1/2") of insulation and tinned.

- 2.4 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.
- 2.5 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.
- 2.6 Gaskets. Wherever necessary to make a completely dustproof, moistureproof and weatherproof assembly of the housing and optical system, approved type gaskets of neoprene or silicone rubber must be provided.
- 2.7 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.
- 2.8 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 "TRAFFIC SIGNAL, TWELVE INCH, POLYCARBONATE, LED OPTICS" and the number of Sections as required, the color and indication types, the name of the manufacturer, the pertinent Contract Number and the appropriate City Commodity Code Number.

3. TESTING AND DOCUMENTATION REQUIREMENTS

- 3.1 Documentation. The contractor must provide certified manufacturing and testing documentation to demonstrate that the traffic signals being supplied meet or exceed the specification requirements. The LED Optical Units must be tested by an independent and certified testing laboratory.
- 3.2 Inspection. The signals will be subject to inspection at the discretion of the Commissioner. Final inspection must be made at point of delivery. Any signal rejected must be removed and disposed of by the contractor at his sole cost.
- 3.3 Warranty. The contractor 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 first three (3) years of the warranty period, the Contractor must repair or replace such defects and failures at no expense to the City and reimburse the City for any labor costs associated with replacing defective LED units. In the event defects or failures occur in the LED units during the last four (4) years of the warranty period, the contractor must repair and/or replace all defective materials at no expense to the City. This warranty must be evidenced by a letter or certificate of warranty submitted to the City at the time 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.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1494
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
MARCH 20, 2000**

**PEDESTRIAN TRAFFIC SIGNAL, 16 INCH
WITH SYMBOLIC LED WALK/DON'T WALK LENSES
POLYCARBONATE HOUSING**

1. GENERAL REQUIREMENTS

- 1.1 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.
- 1.2 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 fourteen (14) working days upon request of the Commissioner. 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 Definitions. Where referenced in the specification, the following definitions will apply:

1.4.1 Approval. Approval will mean approval in writing by the Commissioner or his/her duly authorized representative.

2. MATERIALS 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 deg. F	ASTM D 1525
Brittleness temp.	Below-200 deg. 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) 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 ½" pipe fittings and brackets.
- (c) 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 the VTCSH standards for color (chromaticity) and brightness (luminance). During the required operating life of LED signal units, the luminance output of the units must not be less than 60 percent (.60) of the values specified in the standard.
 - (c) Unit power supply must be constant current regulated and filtered to provide instant on indications, and to prevent momentary signal outages or flicker.
 - (d) Units must consist of LEDs uniformly distributed to present a homogeneous appearance on the face of the lens from a wide viewing angle.
 - (e) LEDs 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 the traffic signal controller equipment currently in use by the City of Chicago, and meeting the City's latest specifications for traffic signal control equipment. In particular the LED unit must be compatible with the NEMA TS-1 and later traffic signal load switches and conflict monitors.
- (m) Units must meet applicable sections of Title 47, SubPart B, Section 15 of the Federal Communications Commission (FCC) rules as applies to electronic noise limitation and electromagnetic interference.
- (n) Total harmonic distortion (THD) induced into the voltage and current AC power line sine waves must not exceed 20 percent.
- (o) Burn-In. LED Optical units must be energized for a minimum 24 hour burn-in at 100% on-time duty cycle.

2.3.2 Symbolic Messages. 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 ½") 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 PTC SI.

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, thermo-plastic insulation meeting MIL-W-76A specifications. The ends of the lamp leads must be stripped of one-half inch (½") 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.
- 2.8 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.
- 2.9 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, and the pertinent contract number.

3. TESTING AND DOCUMENTATION REQUIREMENTS

- 3.1 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.
- 3.2 Inspection. The signals must be subject to inspection at the discretion of the Commissioner. Final inspection must be made at point of delivery. Any signal rejected must be removed and disposed of by the contractor at his sole cost.
- 3.3 Warranty. The contractor 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 first three (3) years of the warranty, the Contractor must repair or replace such defects and failures at no expense to the City and reimburse the City for any labor costs associated with replacing defective units. In the event defects or failures in the LED units occur during the last four (4) years of the warranty period, the contractor must repair and/or replace all defective materials at no expense to the City. This warranty must be evidenced by a letter or certificate of warranty submitted to the City at the time final delivery is made. The warranty must cover all units delivered in an order or installed by contract, and must include 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.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1495
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
MARCH 20, 2000**

**TRAFFIC SIGNAL MOUNTING BRACKET
POLYCARBONATE, SIDE OF POLE**

1. GENERAL REQUIREMENTS

- 1.1 This specification states the requirements for polycarbonate brackets designed for mounting 12 inch traffic and pedestrian signal heads from side of poles.
- 1.2 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 fourteen (14) working days upon request of the Commissioner. 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)

- 1.4 Definitions. Where referenced in the specification, the following definitions will apply:
- 1.4.1 Approval. Approval will mean approval in writing by the Commissioner or his/her duly authorized representative.

2. MATERIALS AND EQUIPMENT REQUIREMENTS

- 2.1 The bracket must be one piece, ultra violet stabilized polycarbonate resin of the specified color, injection molded complete with integral top, bottom, and sides.
- (a) 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 deg. F	ASTM D 1525
Brittleness temp.	Below-200 deg. 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) Glass. The polycarbonate must be glass impregnated between 30% and 40% to increase strength.
- 2.2 Positioning Device. 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.
- 2.3 Hardware. 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.
- 2.4 Dimensions. The bracket must have nominal dimensions of 12 inches long, by 6 inches high, by 3 inches wide, plus or minus 1/4 inch.
- 2.5 Wiring Space. The bracket must have an integral molded wireway with a minimum 1-1/2 inch diameter opening suitable for installation of multi-conductor cables.
- 2.6 Design Strength. The bracket must be designed to support a 12 inch, single face, five-section, polycarbonate signal head with a 100 mile-per-hour wind
- 2.7 Packing. Each bracket must be packed in a suitable carton so secured that the bracket will not be damaged during shipment, handling, or storage.
- 2.8 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, and the pertinent contract number.

3. TESTING AND DOCUMENTATION REQUIREMENTS

- 3.1 Documentation. The contractor must provide certified manufacturing and testing documentation to demonstrate that the brackets being supplied meet or exceed the specification requirements.
- 3.2 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.
- 3.3 Warranty. The contractor 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 Contractor 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.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1496
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
JUNE 1, 2000**

**TRAFFIC SIGNAL: OPTICALLY PROGRAMMED, TWELVE-INCH
SINGLE FACE, SINGLE OR MULTIPLE-SECTION**

1. GENERAL REQUIREMENTS

- 1.1 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.
- 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 fourteen (14) working days upon request of the Commissioner. 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 Definitions. Where referenced in the specification, the following definitions will apply:
- 1.4.1 Approval. Approval will mean approval in writing by the Commissioner or his/her duly authorized representative.

2. MATERIALS AND EQUIPMENT REQUIREMENTS

- 2.1 The traffic signal heads must conform to ITE Standard "Vehicle Traffic Control Signal Heads" (VTCSH), in which the most recently published revisions will govern.
- 2.2 Housing. The housing of each section must be one piece, cast aluminum, complete with integral top, bottom, and sides.
- (a) 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 PROPOSAL 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) 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.

2.3 The traffic signal heads must be provided with incandescent optical units capable of providing a selectively visible or veiled projected indication anywhere within 15 degrees of the signal optical axis.

2.3.1 OPTICAL UNITS

- (a) Optical System. The optical system will consist of incandescent lamp, 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.
- (b) Lamp. The lamp must be a nominal 150 watt, 3 prong, sealed beam, PAR type unit having an integral reflector, and an average rated life of not less than 6,000 hours.
- (c) 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.

- (d) 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.
- (e) 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.
- (f) Photo Control. The photo control must comprise an integrated, directional light sensing and regulating device interposed between lamp and line wires. The lamp intensity must not be less than 97 percent of uncontrolled intensity at 1,000 foot-candles and must be reduced to 15 ± 2 percent of maximum at less than 1 foot-candle. The response must be proportional and essentially instantaneous to any detectable increase of illumination from darkness to 1,000 foot-candles and damped for any increase from 1,000 foot-candles. The photo control must be compatible with 60-hertz input and responsive within the range of 95 to 130 volts at a temperature range of -40 to 165 degrees F. The nominal open circuit impedance of the photo control unit must be 1000 ohms minimum.

2.4 Wiring. 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 (1/2") 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-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.

- 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 a 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 dust-proof, moisture-proof and weatherproof assembly of the housing and optical system, approved type gaskets of neoprene or silicone rubber must be provided.

3. TESTING AND DOCUMENTATION REQUIREMENTS

- 3.1 Documentation. The contractor must provide certified manufacturing and testing documentation to demonstrate that the traffic signals being supplied meet or exceed the specification requirements.
- 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.
- 3.3 Warranty. The contractor 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 the event defects and failures become apparent during this period, the Contractor 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.

4. PACKAGING

- 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, OPTICALLY PROGRAMMED", the number of Sections as required, the colors, the name of the manufacturer, the pertinent Contract Number and the appropriate City Commodity Code Number.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1518
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
APRIL 17, 2001**

INTERNALLY ILLUMINATED SIGN

SUBJECT

1. This specification states the requirements for an internally illuminated sign. The sign legend will read "NO LEFT TURN", "NO RIGHT TURN", "NO TURNS", or "DO NOT ENTER", or as required. The sign will be legible at all times or will be a blank out type sign which must only be legible when illuminated.

GENERAL

2. (a) Specifications. The illuminated sign must conform in detail to the requirements herein stated, to the specifications of the MUTCD, and to Article 1085.56 of the Standard Specifications.
- (b) Acceptance. Illuminated signs not conforming to this specification will not be accepted.
- (c) Warranty. The contractor must warrant the signs against defective design, material, and workmanship for a period of one (1) year from date of acceptance. In the event of defects or failure during this period, the contractor must repair or replace such defects or failures at no expense to the City. This warranty must be evidenced by a letter or certificate of warranty submitted to the City at the time of final delivery.
- (d) Bidders Drawings. Bidders must submit with their bids detailed scale drawings of the illuminated sign proposed to be used. The drawings must show every dimension necessary to indicate how parts will fit each other and be properly held in assembly.
- (e) Sample. One complete illuminated sign assembly of the manufacture intended to be furnished must be submitted within fourteen (14) business days upon request of the Purchasing Agent.

DETAIL REQUIREMENTS

3. (a) Housing. The case must be formed from 3003H14 sheet aluminum at least .1 inch thick with 2 inch corner radii. The painting must be done in accordance with Section 851 of the Standard Specifications. The case must be primed inside and out with one coat of zinc primer. The inside must be white enamel. The outside must be painted with two coats of baked on enamel of a matte black finish. The case will be furnished with 1 ½" hubs, top and bottom. All nuts and bolts are to be 18-8 stainless steel.

- (b) **Sign Face.** The sign face must be fabricated of material meeting the requirements of Article 1085.56 of the Standard Specifications. The face must be held in place by a formed aluminum channel. The message must read "NO LEFT TURN", "NO RIGHT TURN", "NO TURNS", "DO NOT ENTER", or other message as required by the Commissioner. The message must meet the requirements of the MUTCD. Each sign face must be 24" wide by 30" long.
- (c) **Illumination.** The sign must be illuminated by 8 incandescent lamps of 25 watts each for the non-fiber optic signs. Fiber optic signs must be illuminated by a minimum of two 42 watt lamps, so wired so that if one lamp burns out the sign will still be legible. Fiber optic signs must be meet the requirements of Article 1085.56 of the Standard Specifications.
- (d) **Photo-cell.** The sign case must be modified by the installation of a NEMA standard receptacle for a photo-cell on top of the sign case. The photo-cell must meet Material Specification 1471. The socket must be connected using #12 AWG 90 degree Centigrade wire into the line side of the service to provide photoelectric control over all the lamps in the sign.
- (e) **Legibility.** The sign must be legible 24 hours a day or only for specific time periods depending upon the requirements for the internally illuminated sign. Signs that are legible for specific time periods must be switched on and off from the traffic controller.

PACKAGING

- 4. (a) **General.** The signs must be shipped fully assembled and ready for installation. Each assembly must be individually wrapped and boxed so that the assembly is not damaged in shipment.
- (b) **Labeling.** Each box must be labeled in 3/8 inch high letters "ILLUMINATED SIGN" with "BLANK OUT" or "FIBER OPTIC" also in 3/8 inch high letters; the message also should be in 3/8" high letters. The City Commodity Code, contract number, manufacturer, and date of manufacture must be clearly labeled on the box.

THIS SPECIFICATION MUST NOT BE ALTERED

CONTRACTOR'S DAILY WORK SCHEDULE

Description:

The Contractor shall submit a daily work schedule to the Resident Engineer for the purpose of coordinating the Contractor's activities for the next working day. The daily schedule must be submitted by 3:00 pm the day before. This schedule is necessary for the Engineer to schedule inspection, testing and layout checking for the following day.

The schedule shall include the location and type of all work to be performed that day and all material deliveries. It shall identify all concrete pours, the concrete mix design numbers, and estimated number of cubic yards. The placement of bituminous materials shall be identified, including the mix design numbers, location and number of estimated tons to be placed. The Contractor shall identify all locations where survey verification is required and shall give sufficient advance notification to the Engineer so as not to cause delay.

Method of Measurement:

This coordination work will not be measured for payment.

Basis of Payment:

Preparation and submittal of the Contractor's Daily Work Schedule shall not be paid for separately, but shall be included in the cost of the contract items of work.

REMOVE EXISTING STREET LIGHTING UNIT FOUNDATION

Description. This item consists of removing a concrete foundation for a street lighting unit completely to a level three feet below the grade, disposing of the debris off-site in an approved manner, backfilling the excavation with screenings or other approved backfill material, and reconstruction of the surface area. If the foundation is in a parkway, the parkway shall be properly restored with dirt to the existing level. If the foundation is in sidewalk, the sidewalk shall be restored under a separate pay item and shall not be considered part of this work.

General Requirements. Perform work in accordance with Section 801 of the Standard Specifications, the Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Removal. Removal must be in accordance with Article 842.05 of the Standard Specifications, except for the last three paragraphs, which are revised to read as follows:

"All concrete reinforcement around embedded poles must be removed. Removal must extend deeper than 24 inches, where required to remove the existing pole intact, at no additional cost. Raised foundations must be removed at no additional cost.

Method of Measurement. Each concrete foundation that is broken down, removed from the site, and the excavation backfilled as specified herein will be counted as a unit for payment.

Basis of Payment. This work will be paid for at the contract unit price per each for REMOVE EXISTING STREET LIGHTING UNIT FOUNDATION, which will be payment in full for the material and work described herein.

(CTE – 11/22/2004)

CONCRETE ADMIXTURES (BDE)

Effective: January 1, 2003

Revised: July 1, 2004

Revise Article 1020.05(b) of the Standard Specifications to read:

“(b) Admixtures. Except as specified, the use of admixtures to increase the workability or to accelerate the hardening of the concrete will be permitted only when approved in writing by the Engineer. The Department will maintain an Approved List of Concrete Admixtures. When the Department permits the use of a calcium chloride accelerator, it shall be according to Article 442.02, Note 5.

When the atmosphere or concrete temperature is 18 °C (65 °F) or higher, a retarding admixture meeting the requirements of Article 1021.03 shall be used in the Class BD Concrete and portland cement concrete bridge deck overlays. The amount of retarding admixture to be used will be determined by the Engineer. 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 Class BD Concrete. The amount of high range water-reducing admixture will be determined by the Engineer. At the option of the Contractor, a water-reducing admixture may be used. Type I cement shall be used.

For Class PC and PS Concrete, a retarding admixture may be added to the concrete mixture when the concrete temperature is 18 °C (65 °F) or higher. Other admixtures may be used when approved by the Engineer, or if specified by the contract. If an accelerating admixture is permitted by the Engineer, it shall be the non-chloride type.

At the Contractor’s option, admixtures in addition to an air-entraining admixture may be used for Class PP-1 concrete. The accelerator shall be the non-chloride type. If a water-reducing or retarding admixture is used, the cement factor may be reduced a maximum 18 kg/cu m (0.30 hundredweight/cu yd). If a high range water-reducing admixture is used, the cement factor may be reduced a maximum 36 kg/cu m (0.60 hundredweight/cu yd). Cement factor reductions shall not be cumulative when using multiple admixtures. An accelerator shall always be added prior to a high range water-reducing admixture, if both are used.

If Class C fly ash or ground granulated blast-furnace slag is used in Class PP-1 concrete, a water-reducing or high range water-reducing admixture shall be used. However, the cement factor shall not be reduced if a water-reducing, retarding, or high range water-reducing admixture is used. In addition, an accelerator shall not be used.

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. For Class PP-3 concrete, the non-chloride accelerator shall be calcium nitrite.

For Class PP-2 or PP-3 concrete, the Contractor has the option to use a water-reducing admixture. A retarding admixture shall not be used unless approved by the Engineer. A water-reducing, retarding, or high range water-reducing admixture shall not be used to reduce the cement factor.

When the air temperature is less than 13 °C (55 °F) for Class PP-1 or PP-2 concrete, the non-chloride accelerator shall be calcium nitrite.

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. 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 according to Article 1103.04, but a retarding admixture shall not be used unless approved by the Engineer. A water-reducing, retarding, or high range water-reducing admixture shall not be used to reduce the cement factor.

If the Department specifies a calcium chloride accelerator for Class PP-1 concrete, the maximum chloride dosage shall be 1.0 L (1.0 quart) of solution per 45 kg (100 lb) of cement. The dosage may be increased to a maximum 2.0 L (2.0 quarts) per 45 kg (100 lb) of cement if approved by the Engineer. If the Department specifies a calcium chloride accelerator for Class PP-2 concrete, the maximum chloride dosage shall be 1.3 L (1.3 quarts) of solution per 45 kg (100 lb) of cement. The dosage may be increased to a maximum 2.6 L (2.6 quarts) per 45 kg (100 lb) of cement if approved by the Engineer.

For Class PV, MS, SI, RR, SC and SH concrete, at the option of the Contractor, or when specified by the Engineer, a water-reducing admixture or a retarding admixture may be used. The amount of water-reducing admixture or retarding admixture permitted will be determined by the Engineer. The air-entraining admixture and other admixtures shall be added to the concrete separately, and shall be permitted to intermingle only after they have separately entered the concrete batch. The sequence, method and equipment for adding the admixtures shall be approved by the Engineer. The water-reducing admixture shall not delay the initial set of the concrete by more than one hour. Type I cement shall be used.

When a water-reducing admixture is added, a cement factor reduction of up to 18 kg/cu m (0.30 hundredweight/cu yd), from the concrete designed for a specific slump without the admixture, will be permitted for Class PV, MS, SI, RR, SC and SH concrete. When an approved high range water-reducing admixture is used, a cement factor reduction of up to 36 kg/cu m (0.60 hundredweight/cu yd), from a specific water cement/ratio without the admixture, will be permitted based on a 14 percent minimum water reduction. This is applicable to Class PV, MS, SI, RR, SC and SH concrete. A cement factor below 320 kg/cu m (5.35 hundredweight/cu yd) will not be permitted for Class PV, MS, SI, RR, SC and SH concrete. A cement factor reduction will not be allowed for concrete placed underwater. Cement factor reductions shall not be cumulative when using multiple admixtures.

For use of admixtures to control concrete temperature, refer to Articles 1020.14(a) and 1020.14(b).

The maximum slumps given in Table 1 may be increased to 175 mm (7 in.) when a high range water-reducing admixture is used for all classes of concrete except Class PV and PP.”

Revise Section 1021 of the Standard Specifications to read:

“SECTION 1021. CONCRETE ADMIXTURES”

1021.01 General. Admixtures shall be furnished in liquid form ready for use. The admixtures may be delivered in the manufacturer's original containers, bulk tank trucks or such containers or tanks as are acceptable to the Engineer. Delivery shall be accompanied by a ticket which clearly identifies the manufacturer and trade name of the material. Containers shall be readily identifiable to the satisfaction of the Engineer as to manufacturer and trade name of the material they contain.

Prior to inclusion of a product on the Department's Approved List of Concrete Admixtures, the manufacturer shall submit a report prepared by an independent laboratory accredited by the AASHTO Accreditation Program. The report shall show the results of physical tests conducted no more than five years prior to the time of submittal, according to applicable specifications.

Tests shall be conducted using materials and methods specified on a "test" concrete and a "reference" concrete, together with a certification that no changes have been made in the formulation of the material since the performance of the tests. Per the manufacturer's option, the cement content for all required tests shall either be according to applicable specifications or 335 kg/cu m (5.65 cwt/cu yd). Compressive strength test results for six months and one year will not be required.

In addition to the report, the manufacturer shall submit AASHTO T 197 water content and set time test results on the standard cement used by the Department. The test and reference concrete mixture shall contain a cement content of 335 kg/cu m (5.65 cwt/cu yd). The manufacturer may select their lab or an independent lab to perform this testing. The laboratory is not required to be accredited by the AASHTO Accreditation Program.

Prior to the approval of an admixture, the Engineer may conduct all or part of the applicable tests on a sample that is representative of the material to be furnished. The test and reference concrete mixtures tested by the Engineer will contain a cement content of 335 kg/cu m (5.65 cwt/cu yd). For freeze-thaw testing, the Department will perform the test according to Illinois Modified AASHTO T 161, Procedure B.

The manufacturer shall include in the submittal the following information according to ASTM C 494; the average and manufacturing range of specific gravity, the average and manufacturing range of solids in the solution, and the average and manufacturing range of pH. The submittal shall also include an infrared spectrophotometer trace no more than five years old.

When test results are more than seven years old, the manufacturer shall re-submit the infrared spectrophotometer trace and the report prepared by an independent laboratory accredited by the AASHTO Accreditation Program.

All admixtures, except chloride-based accelerators, shall contain no more than 0.3 percent chloride by mass (weight).

1021.02 Air-Entraining Admixtures. Air-entraining admixtures shall conform to the requirements of AASHTO M 154.

If the manufacturer certifies that the air-entraining admixture is an aqueous solution of Vinsol resin that has been neutralized with sodium hydroxide (caustic soda), testing for compliance with the requirements may be waived by the Engineer. In the certification, the manufacturer shall show complete information with respect to the formulation of the solution, including the number of parts of Vinsol resin to each part of sodium hydroxide. Before the approval of its use is granted, the Engineer will test the solution for its air-entraining quality in comparison with a solution prepared and kept for that purpose.

1021.03 Retarding and Water-Reducing Admixtures. The admixture shall comply with the following requirements:

- (a) The retarding admixture shall comply with the requirements of AASHTO M 194, Type B (retarding) or Type D (water-reducing and retarding).
- (b) The water-reducing admixture shall comply with the requirements of AASHTO M 194, Type A.
- (c) The high range water-reducing admixture shall comply with the requirements of AASHTO M 194, Type F (high range water-reducing) or Type G (high range water-reducing and retarding).

When a Type F or Type G high range water-reducing admixture is used, water-cement ratios shall be a minimum of 0.32.

Type F or Type G admixtures may be used, subject to the following restrictions:

For Class MS, SI, RR, SC and SH concrete, the water-cement ratio shall be a maximum of 0.44.

The Type F or Type G admixture shall be added at the jobsite unless otherwise directed by the Engineer. The initial slump shall be a minimum of 40 mm (1 1/2 in.) prior to addition of the Type F or Type G admixture, except as approved by the Engineer.

When a Type F or Type G admixture is used, retempering with water or with a Type G admixture will not be allowed. An additional dosage of a Type F admixture, not to exceed 40 percent of the original dosage, may be used to retemper concrete once, provided set time is not unduly affected. A second retempering with a Type F admixture may be used for all classes of concrete except Class PP and SC, provided that the dosage does not exceed the dosage used for the first retempering, and provided that the set time is not unduly affected. No further retempering will be allowed.

Air tests shall be performed after the addition of the Type F or Type G admixture.

1021.04 Set Accelerating Admixtures. The admixture shall comply with the requirements of AASHTO M 194, Type C (accelerating) or Type E (water reducing and accelerating)”

DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION (BDE)

Effective: September 1, 2000

Revised: June 1, 2004

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. 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. 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 DBE Directory or most recent addendum.

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 federally-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate.

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 firms 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. This 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 20.00% 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 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 forth in this Special Provision:

- (a) The bidder documents that firmly committed 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 may consult the DBE Directory as a reference source for DBE companies certified by the Department. 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 web site at www.dot.state.il.us.

BIDDING PROCEDURES. Compliance with the bidding procedures of this Special Provision is required prior to the award of the contract and the failure of the as-read low bidder to comply will render the bid nonresponsive.

- (a) In order to assure the timely award of the contract, the as-read low bidder must submit a Disadvantaged Business Utilization Plan on Department form SBE 2026 within seven (7) working days after the date of letting. To meet the seven (7) day requirement, the bidder may send the Plan by certified mail or delivery service within the seven (7) working day period. If a question arises concerning the mailing date of a Plan, the mailing date will be established by the U.S. Postal Service postmark on the original certified mail receipt from the U.S. Postal Service or the receipt issued by a delivery service. It is the responsibility of the as-read low bidder to ensure that the postmark or receipt date is affixed within the seven (7) working days if the bidder intends to rely upon mailing or delivery to satisfy the submission day requirement. The Plan is to be submitted 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). It is the responsibility of the bidder to obtain confirmation of telefax delivery. The Department will not accept a Utilization Plan if it does not meet the seven (7) day submittal requirement, and the bid will be declared nonresponsive. In the event the bid is declared nonresponsive due to a failure to submit a Plan or failure to comply with the bidding procedures set forth herein, the Department may elect to cause the forfeiture of the penal sum of the bidder's proposal guaranty, and may deny authorization to bid the project if re-advertised for bids. The Department reserves the right to invite any other bidder to submit a Utilization Plan at any time for award consideration or to extend the time for award.
- (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. The signatures on these forms must be original signatures. All elements of information indicated on the said form shall be provided, including but not limited to the following:
 - (1) The name and address of each DBE to be used;
 - (2) A description, including pay item numbers, of the commercially useful work to be done by each DBE;

- (3) The price to be paid to each DBE for the identified work specifically stating 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) A commitment statement signed by the bidder and each DBE evidencing availability and intent to perform commercially useful work on the project; and
 - (5) If the bidder is a joint venture comprised of DBE firms and non-DBE firms, the plan must also include a clear identification of the portion of the work to be performed by the DBE partner(s).
- (d) The contract will not be awarded until the Utilization Plan submitted by the bidder is approved. The Utilization Plan will be approved by the Department if the Plan commits sufficient commercially useful DBE work performance to meet the contract goal. The Utilization Plan will not be approved by the Department if the Plan does not commit sufficient DBE performance to meet the contract goal unless the bidder documents that it made a good faith effort to meet the goal. The good faith procedures of Section VIII of this special provision apply. If the Utilization Plan is not approved because it is deficient in a technical matter, unless waived by the Department, the bidder will be notified and will be allowed no less than a five (5) working day period in order to cure the deficiency.

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% 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 firm does not count toward the DBE goals.
- (b) DBE as a joint venture Contractor: 100% 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% 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 firm does not count toward the DBE goal.

- (d) DBE as a trucker: 100% 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 full value of all such DBE trucks operated using DBE employed drivers. Goal credit will be limited to the value of the reasonable fee or commission received by the DBE if trucks are leased from a non-DBE company.
- (e) DBE as a material supplier:
 - (1) 60% goal credit for the cost of the materials or supplies purchased from a DBE regular dealer.
 - (2) 100% goal credit for the cost of materials or supplies obtained from a DBE manufacturer.
 - (3) 100% credit for the value of reasonable fees and commissions for the procurement of materials and supplies if not a regular dealer or manufacturer.

GOOD FAITH EFFORT PROCEDURES. If the bidder cannot obtain sufficient DBE commitments to meet the contract goal, the bidder must document in the Utilization Plan the good faith efforts made in the attempt 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 could reasonably be expected to obtain sufficient DBE participation. The Department will consider the quality, quantity and intensity of the kinds of efforts that the bidder has made. Mere *pro forma* efforts are not good faith efforts; rather, the bidder is expected to have taken those 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 prime contractor to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Prime contractors 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 contractor'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 contractor'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 Contractor 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 a good faith effort has not been made, the Department will notify the bidder of that preliminary determination by contacting the responsible company official designated in the Utilization Plan. The preliminary determination shall include a statement of reasons why good faith efforts have not been found, and may include additional good faith efforts that the bidder could take. The notification will designate a five (5) working day period during which the bidder shall take additional efforts. The bidder is not limited by a statement of additional efforts, but may take other action beyond any stated additional efforts in order to obtain additional DBE commitments. The bidder shall submit an amended Utilization Plan if additional DBE commitments to meet the contract goal are secured. If additional DBE commitments sufficient to meet the contract goal are not secured, the bidder shall report the final good faith efforts made in the time allotted. All additional efforts taken by the bidder will be considered as part of the bidder's good faith efforts. If the bidder is not able to meet the goal after taking additional efforts, the Department will make a pre-final determination of the good faith efforts of the bidder and will notify the designated responsible company official of the reasons for an adverse determination.
- (c) The bidder may request administrative reconsideration of a pre-final determination adverse to the bidder within the five (5) working days after 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 pre-final determination shall become final if a request is not made and delivered. A request may provide additional written documentation and/or argument concerning the issue of whether an adequate good faith effort was made to meet the contract goal. In addition, the request shall be considered a consent by the bidder to extend the time for award. 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 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 (10) working days after receipt of the request for reconsideration, explaining the basis for finding that the bidder did or did not meet the goal or make adequate good faith efforts to do so. A final decision by the Reconsideration Officer that a good faith effort was made shall approve the Utilization Plan submitted by the bidder and shall clear the contract for award. A final decision that a good faith effort was not made shall render the bid nonresponsive.

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 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.

- (a) 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) All work indicated for performance by an approved DBE shall be performed, managed and supervised by the DBE executing the Participation Statement. The Contractor shall not terminate for convenience a DBE listed in the Utilization Plan and then perform the work of the terminated DBE with its own forces, those of an affiliate or those of another subcontractor, whether DBE or not, without first obtaining the written consent of the Bureau of Small Business Enterprises to amend the Utilization Plan. If a DBE listed in the Utilization Plan is terminated for reasons other than convenience, or fails to complete its work on the contract for any reason, the Contractor shall make good faith efforts to find another DBE to substitute for the terminated DBE. The good faith efforts shall be directed at finding another DBE to perform at least the same amount of work under the contract as the DBE that was terminated, but only to the extent needed to meet the contract goal or the amended contract goal. The Contractor shall notify the Bureau of Small Business Enterprises of any termination for reasons other than convenience, and shall obtain approval for inclusion of the substitute DBE in the Utilization Plan. If good faith efforts following a termination of a DBE for cause are not successful, the Contractor shall contact the Bureau and provide a full accounting of the efforts undertaken to obtain substitute DBE participation. The Bureau will evaluate the good faith efforts in light of all circumstances surrounding the performance status of the contract, and determine whether the contract goal should be amended.
- (c) 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 therefor to the DBE by the Contractor, but not later than thirty (30) calendar days after payment has been made by the Department to the Contractor for such work or material, the Contractor shall submit a DBE Payment Report on Department form SBE 2115 to the District Engineer. If full and final payment has not been made to the DBE, the Report 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 Plan, the Department will deduct from contract payments to the Contractor the amount of the goal not achieved as liquidated and ascertained damages.
- (d) 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.

FLAGGER VESTS (BDE)

Effective: April 1, 2003

Revise the first sentence of Article 701.04(c)(1) of the Standard Specifications to read:

“The flagger shall be stationed to the satisfaction of the Engineer and be equipped with a fluorescent orange, fluorescent yellow/green or a combination of fluorescent orange and fluorescent yellow/green vest meeting the requirements of the American National Standards Institute specification ANSI/ISEA 107-1999 for Conspicuity Class 2 garments and approved flagger traffic control signs conforming to Standard 702001 and Article 702.05(e).”

Revise Article 701.04(c)(6) of the Standard Specifications to read:

“(6) Nighttime Flagging. The flagger station shall be lit by additional overhead lighting other than streetlights. The flagger shall be equipped with a fluorescent orange or fluorescent orange and fluorescent yellow/green garment meeting the requirements of the American National Standards Institute specification ANSI/ISEA 107-1999 for Conspicuity Class 2 garments.”

80101

MINIMUM LANE WIDTH WITH LANE CLOSURE (BDE)

Effective: January 1, 2005

Add the following paragraph after the eighth paragraph of Article 701.04(a) of the Standard Specifications.

“The minimum lane width adjacent to a closed lane during paving, patching, and other moving operations on freeways and expressways shall be a minimum of 3 m (10 ft). The 3 m (10 ft) shall be clear, unobstructed, and free of channelizing devices or other obstacles.”

80137

PARTIAL PAYMENTS (BDE)

Effective: September 1, 2003

Revise Article 109.07 of the Standard Specifications to read:

“**109.07 Partial Payments.** Partial payments will be made as follows:

- (a) Progress Payments. At least once each month, the Engineer will make a written estimate of the amount of work performed in accordance with the contract, and the value thereof at the contract unit prices. The amount of the estimate approved as due for payment will be vouchered by the Department and presented to the State Comptroller for payment. No amount less than \$1000.00 will be approved for payment other than the final payment.

The failure to perform any requirement, obligation, or term of the contract by the Contractor shall be reason for withholding any progress payments until the Department determines that compliance has been achieved. Furthermore, progress payments may be reduced by liens filed pursuant to Section 23(c) of the Mechanics Lien Act, 770 ILCS 60/23(c).

- (b) Material Allowances. At the discretion of the Department, payment may be made for materials, prior to their use in the work, when satisfactory evidence is presented by the Contractor. Satisfactory evidence includes justification for the allowance (to expedite the work, meet project schedules, regional or national material shortages, etc.), documentation of material and transportation costs, and evidence that such material is properly stored on the project or at a secure location acceptable and accessible to the Department.

Material allowances will be considered only for nonperishable materials when the cost, including transportation, exceeds \$10,000 and such materials are not expected to be utilized within 60 days of the request for the allowance. For contracts valued under \$500,000, the minimum \$10,000 requirement may be met by combining the principal (material) product of no more than two contract items. An exception to this two item limitation may be considered for any contract regardless of value for items in which material (products) are similar except for type and/or size.

Material allowances shall not exceed the value of the contract items in which used and shall not include the cost of installation or related markups. Amounts paid by the Department for material allowances will be deducted from estimates due the Contractor as the material is used. Two-sided copies of the Contractor's cancelled checks for materials and transportation must be furnished to the Department within 60 days of payment of the allowances or the amounts will be reclaimed by the Department."

80116

PAYMENTS TO SUBCONTRACTORS (BDE)

Effective: June 1, 2000

Revised: September 1, 2003

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 no later than 30 days from the receipt of each payment made to the Contractor.

State law addresses the timing of payments to be made to subcontractors. Section 7 of the Prompt Payment Act, 30 ILCS 540/7, generally requires that when a Contractor receives any payment from the Department, the Contractor is required to make corresponding, proportional payments to each subcontractor performing work within 15 calendar days after receipt of the state payment. Section 7 of the State Prompt Payment Act further provides that interest in the amount of 2% per month, in addition to the payment due, shall be paid to any subcontractor 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 throughout the contracting chain.

This Special Provision establishes the required federal contract clause, and adopts the 15 calendar day requirement of the Act for purposes of compliance with the federal regulation regarding payments to subcontractors. This contract is subject to the following payment obligations.

As progress payments are made to the Contractor in accordance with Article 109.07 of the Standard Specifications for Road and Bridge Construction, the Contractor shall make a corresponding partial payment within 15 calendar days to each subcontractor in proportion to the work satisfactorily completed by each subcontractor. The proportionate amount of partial payment due to each subcontractor 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 shall be paid in full within 15 calendar days after the subcontractor's work has been satisfactorily completed. The Contractor shall hold no retainage from the subcontractors.

This Special Provision does not create any rights in favor of any subcontractor against the State of Illinois or authorize any cause of action against the State of Illinois on account of any payment, nonpayment, delayed payment or interest claimed by application of the State Prompt Payment Act. The Department will neither determine the reasonableness of any cause for delay of payment nor enforce any claim to payment, including interest. Moreover, the Department will not approve any delay or postponement of the 15 day requirement. State law creates 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 in accordance with the Public Construction Bond Act, 30 ILCS 550.

80022

PERSONAL PROTECTIVE EQUIPMENT (BDE)

Effective: July 1, 2004

All personnel, excluding flaggers, working outside of a vehicle (car or truck) within 7.6 m (25 ft) of pavement open to traffic shall wear a fluorescent orange, fluorescent yellow/green or a combination of fluorescent orange and fluorescent yellow/green vest meeting the requirements of the American National Standards Institute specification ANSI/ISEA 107-1999 for Conspicuity Class 2 garments. Other types of garments may be substituted for the vest as long as the garments have manufacturers tags identifying them as meeting the ANSI Class 2 requirement.

80130

PORTABLE CHANGEABLE MESSAGE SIGNS (BDE)

Effective: November 1, 1993

Revised: April 2, 2004

Description. This work shall consist of furnishing, placing, and maintaining changeable message sign(s) at the locations(s) shown on the plans or as directed by the Engineer.

The sign(s) shall be trailer mounted. The message panel shall be at least 2.1 m (7 ft) above the pavement, present a level appearance, and be capable of displaying up to eight characters in each of three lines at a time. Character height shall be 450 mm (18 in.).

The message panel shall be of either a bulb matrix or disc matrix design controlled by an onboard computer capable of storing a minimum of 99 programmed messages for instant recall. The computer shall be capable of being programmed to accept messages created by the operator via an alpha-numeric keyboard and able to flash any six messages in sequence. The message panel shall also be capable of being controlled by a computer from a remote location via a cellular linkage. The Contractor shall supply the modem, the cellular phone, and the necessary software to run the sign from a remote computer at a location designated by the Engineer. The Contractor shall promptly program and/or reprogram the computer to provide the messages as directed by the Engineer.

The message panel shall be visible from 400 m (1/4 mile) under both day and night conditions. The letters shall be legible from 250 m (750 ft).

The sign shall include automatic dimming for nighttime operation and a power supply capable of providing 24 hours of uninterrupted service.

The Contractor shall provide all preventive maintenance efforts s(he) deems necessary to achieve uninterrupted service. If service is interrupted for any cause and not restored within 24 hours, the Engineer will cause such work to be performed as may be necessary to provide this service. The cost of such work shall be borne by the Contractor or deducted from current or future compensation due the Contractor.

When the sign(s) are displaying messages, they shall be considered a traffic control device. At all times when no message is displayed, they shall be considered equipment.

Basis of Payment. When portable changeable message signs are shown on the Standard, this work will not be paid for separately but shall be considered as included in the cost of the Standard.

For all other portable changeable message signs, this work will be paid for at the contract unit price per calendar month for each sign as CHANGEABLE MESSAGE SIGN.

80124

PORTLAND CEMENT (BDE)

Effective: January 1, 2005

Replace the first sentence of the second paragraph of Article 1001.01 of the Standard Specifications with the following:

“For portland cement according to ASTM C 150, the addition of up to 5.0 percent limestone by mass (weight) to the cement will not be permitted. Also, the total of all organic processing additions shall not exceed 1.0 percent by mass (weight) of the cement and the total of all inorganic processing additions shall not exceed 4.0 percent by mass (weight) of the cement.”

80139

PORTLAND CEMENT CONCRETE (BDE)

Effective: November 1, 2002

Add the following paragraph after the fourth paragraph of Article 1103.01(b) of the Standard Specifications:

“The truck mixer shall be approved before use according to the Bureau of Materials and Physical Research’s Policy Memorandum, “Approval of Concrete Plants and Delivery Trucks”.”

Add the following paragraph after the first paragraph of Article 1103.01(c) of the Standard Specifications:

“The truck agitator shall be approved before use according to the Bureau of Materials and Physical Research’s Policy Memorandum, “Approval of Concrete Plants and Delivery Trucks”.”

Add the following paragraph after the first paragraph of Article 1103.01(d) of the Standard Specifications:

“The nonagitator truck shall be approved before use according to the Bureau of Materials and Physical Research’s Policy Memorandum, “Approval of Concrete Plants and Delivery Trucks”.”

Revise the first sentence of the first paragraph of Article 1103.02 of the Standard Specifications to read:

“The plant shall be approved before production begins according to the Bureau of Materials and Physical Research’s Policy Memorandum, “Approval of Concrete Plants and Delivery Trucks”.”
80083

TRAFFIC CONTROL DEFICIENCY DEDUCTION (BDE)

Effective: April 1, 1992

Revised: January 1, 2005

To ensure a prompt response to incidents involving the integrity of work zone traffic control, the Contractor shall provide a telephone number where a responsible individual can be contacted 24 hours-a-day.

When the Engineer is notified, or determines a traffic control deficiency exists, he/she will notify and direct the Contractor to correct the deficiency within a specified time. The specified time, which begins upon notification to the Contractor, will be from 1/2 hour to 12 hours based upon the urgency of the situation and the nature of the deficiency. The Engineer shall be the sole judge.

A deficiency may be any lack of repair, maintenance, or non-compliance with the traffic control plan. A deficiency may also be applied to situations where corrective action is not an option such as the use of non-certified flaggers for short term operations; working with lane closures beyond the time allowed in the contract; or failure to perform required contract obligations such as traffic control surveillance.

If the Contractor fails to correct a deficiency within the specified time, a daily monetary deduction will be imposed for each calendar day or fraction thereof the deficiency exists. The calendar day(s) will begin with notification to the Contractor and end with the Engineer's acceptance of the correction. The daily monetary deduction will be either \$1,000 or 0.05 percent of the awarded contract value, whichever is greater. For those deficiencies where corrective action was not an option this monetary deduction will be immediate.

In addition, if the Contractor fails to respond, the Engineer may correct the deficiency and the cost thereof will be deducted from monies due or which may become due the Contractor. This corrective action will in no way relieve the Contractor of his/her contractual requirements or responsibilities.

5729I

TRAFFIC STRUCTURES (BDE)

Effective: November 1, 2002

Add the following sentence to the end of the first paragraph of Article 1069.01(a)(1) of the Standard Specifications:

“Light poles shall be designed for 145 km/hr (90 mph) wind velocity and a minimum design life of 50 years.”

Add the following sentence to the end of the third paragraph of Article 1069.04(a) of the Standard Specifications:

“Light towers shall be designed for 145 km/hr (90 mph) wind velocity and a minimum design life of 50 years.”

Revise the last sentence of the first paragraph of Article 1077.03(a)(1) of the Standard Specifications to read:

“The design shall be according to AASHTO “Standard Specification for Structural Supports for Highway Signs, Luminaries and Traffic Signals” 1994 Edition for 130 km/hr (80 mph) wind velocity. However the arm-to-pole connection shall be according to the “ring plate” detail as shown in Figure 11-1(f) of the 2002 Interim, to the AASHTO “Standard Specification for Structural Supports for Highway Signs, Luminaries and Traffic Signals” 2001 4th Edition.”

80088

TRAFFIC STRUCTURES (BDE)

Effective: November 1, 2002

Add the following sentence to the end of the first paragraph of Article 1069.01(a)(1) of the Standard Specifications:

“Light poles shall be designed for 145 km/hr (90 mph) wind velocity and a minimum design life of 50 years.”

Add the following sentence to the end of the third paragraph of Article 1069.04(a) of the Standard Specifications:

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| 80088

WORK ZONE TRAFFIC CONTROL DEVICES (BDE)

| Effective: January 1, 2003

Revised: November 1, 2004

Add the following to Article 702.01 of the Standard Specifications:

“All devices and combinations of devices shall meet the requirements of the National Cooperative Highway Research Program (NCHRP) Report 350 for their respective categories. The categories are as follows:

Category 1 includes small, lightweight, channelizing and delineating devices that have been in common use for many years and are known to be crashworthy by crash testing of similar devices or years of demonstrable safe performance. These include cones, tubular markers, flexible delineators and plastic drums with no attachments. Category 1 devices shall be crash tested and accepted or may be self-certified by the manufacturer.

Category 2 includes devices that are not expected to produce significant vehicular velocity change but may otherwise be hazardous. These include drums and vertical panels with lights, barricades and portable sign supports. Category 2 devices shall be crash tested and accepted for Test Level 3.

Category 3 includes devices that are expected to cause significant velocity changes or other potentially harmful reactions to impacting vehicles. These include crash cushions, truck mounted attenuators and other devices not meeting the definitions of Category 1 or 2. Category 3 devices shall be crash tested and accepted for either Test Level 3 or the test level specified.

Category 4 includes portable or trailer-mounted devices such as arrow boards, changeable message signs, temporary traffic signals and area lighting supports. Currently, there is no implementation date set for this category and it is exempt from the NCHRP 350 compliance requirement.

The Contractor shall provide a manufacturer's self-certification letter for each Category 1 device and an FHWA acceptance letter for each Category 2 and Category 3 device used on the contract. The letters shall state the device meets the NCHRP 350 requirements for its respective category and test level, and shall include a detail drawing of the device."

Delete the third, fourth and fifth paragraphs of Article 702.03(b) of the Standard Specifications.

Delete the third sentence of the first paragraph of Article 702.03(c) of the Standard Specifications.

Revise the first sentence of the first paragraph of Article 702.03(e) of the Standard Specifications to read:

"Drums shall be nonmetallic and have alternating reflectorized Type AA or Type AP fluorescent orange and reflectorized white horizontal, circumferential stripes."

Add the following to Article 702.03 of the Standard Specifications:

"(h) Vertical Barricades. Vertical barricades may be used in lieu of cones, drums or Type II barricades to channelize traffic."

Delete the fourth paragraph of Article 702.05(a) of the Standard Specifications.

Revise the sixth paragraph of Article 702.05(a) of the Standard Specifications to read:

"When the work operations exceed four days, all signs shall be post mounted unless the signs are located on the pavement or define a moving or intermittent operation. When approved by the Engineer, a temporary sign stand may be used to support a sign at 1.2 m (5 ft) minimum where posts are impractical. Longitudinal dimensions shown on the plans for the placement of signs may be increased up to 30 m (100 ft) to avoid obstacles, hazards or to improve sight distance, when approved by the Engineer. "ROAD CONSTRUCTION AHEAD" signs will also be required on side roads located within the limits of the mainline "ROAD CONSTRUCTION AHEAD" signs."

Delete all references to "Type 1A barricades" and "wing barricades" throughout Section 702 of the Standard Specifications.

80097

SUBCONTRACTOR MOBILIZATION PAYMENTS (BDE)

Effective: January 2, 2005

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 in accordance with 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.

This provision shall be incorporated directly or by reference into each subcontract approved by the Department.

80143

STEEL COST ADJUSTMENT (BDE)

Effective: April 2, 2004

Revised: July 1, 2004

Description. At the bidder's option, a steel cost adjustment will be made to provide additional compensation to the Contractor or a credit to the Department for fluctuations in steel prices. The bidder must indicate on the attached form whether or not steel cost adjustments will be part of this contract. This attached form shall be submitted with the bid. Failure to submit the form shall make this contract exempt of steel cost adjustments.

Types of Steel Products. An adjustment will be made for fluctuations in the cost of steel used in the manufacture of the following items:

Metal Piling (excluding temporary sheet piling)
Structural Steel
Reinforcing Steel

Other steel materials such as dowel bars, tie bars, mesh reinforcement, guardrail, steel traffic signal and light poles, towers and mast arms, metal railings (excluding wire fence), frames and grates, and other miscellaneous items will be subject to a steel cost adjustment when the pay item they are used in has a contract value of \$10,000 or greater.

Documentation. Sufficient documentation shall be furnished to the Engineer to verify the following:

- (a) Evidence that increased or decreased steel costs have been passed on to the Contractor.
- (b) The dates and quantity of steel, in kg (lb), shipped from the mill to the fabricator.
- (c) The quantity of steel, in kg (lb), incorporated into the various items of work covered by this special provision. The Department reserves the right to verify submitted quantities.

Method of Adjustment. Steel cost adjustments will be computed as follows:

$$SCA = Q \times D$$

Where: SCA = steel cost adjustment, in dollars
Q = quantity of steel incorporated into the work, in kg (lb)
D = price factor, in dollars per kg (lb)

$$D = CBP_M - CBP_L$$

Where: CBP_M = The average of the Consumer Buying Price indices for Shredded Auto Scrap (Chicago) and No. 1 Heavy Melt (Chicago) as published by the American Metal Market (AMM) for the day the steel is shipped from the mill. The indices will be converted from dollars per ton to dollars per kg (lb).

CBP_L = The average of the Consumer Buying Price indices for Shredded Auto Scrap (Chicago) and No. 1 Heavy Melt (Chicago) as published by the AMM for the day the contract is let. The indices will be converted from dollars per ton to dollars per kg (lb).

The unit masses (weights) of steel that will be used to calculate the steel cost adjustment for the various items are shown in the attached table.

No steel cost adjustment will be made for any products manufactured from steel having a mill shipping date prior to the letting date.

If the Contractor fails to provide the required documentation, the method of adjustment will be calculated as described above; however, the CBP_M will be based on the date the steel arrives at the job site. In this case, an adjustment will only be made when there is a decrease in steel costs.

Basis of Payment. Steel cost adjustments may be positive or negative but will only be made when there is a difference between the CBP_L and CBP_M in excess of five percent, as calculated by:

$$\text{Percent Difference} = \{(CBP_L - CBP_M) \div CBP_L\} \times 100$$

Steel cost adjustments will be calculated by the Engineer and will be paid or deducted when all other contract requirements for the steel items are satisfied. Adjustments will only be made for fluctuations in the cost of the steel as described herein. No adjustment will be made for changes in the cost of manufacturing, fabrication, shipping, storage, etc.

FAI ROUTE 90/94 (DAN RYAN EXPRESSWAY)
SECTION: 2004-099TS
COOK COUNTY

Attachment

Item	Unit Mass (Weight)
Metal Piling (excluding temporary sheet piling)	
Furnishing Metal Pile Shells 305 mm (12 in.), 3.80 mm (0.179 in.) wall thickness)	34 kg/m (23 lb/ft)
Furnishing Metal Pile Shells 305 mm (12 in.), 6.35 mm (0.250 in.) wall thickness)	48 kg/m (32 lb/ft)
Furnishing Metal Pile Shells 356 mm (14 in.), 6.35 mm (0.250 in.) wall thickness)	55 kg/m (37 lb/ft)
Other piling	See plans
Structural Steel	See plans for weights
Reinforcing Steel	See plans for weights
Dowel Bars and Tie Bars	3 kg (6 lb) each
Mesh Reinforcement	310 kg/sq m (63 lb/100 sq ft)
Guardrail	
Steel Plate Beam Guardrail, Type A w/steel posts	30 kg/m (20 lb/ft)
Steel Plate Beam Guardrail, Type B w/steel posts	45 kg/m (30 lb/ft)
Steel Plate Beam Guardrail, Types A and B w/wood posts	12 kg/m (8 lb/ft)
Steel Plate Beam Guardrail, Type 2	140 kg (305 lb) each
Steel Plate Beam Guardrail, Type 6	570 kg (1260 lb) each
Traffic Barrier Terminal, Type 1 Special (Tangent)	330 kg (730 lb) each
Traffic Barrier Terminal, Type 1 Special (Flared)	185 kg (410 lb) each
Steel Traffic Signal and Light Poles, Towers and Mast Arms	
Traffic Signal Post	16 kg/m (11 lb/ft)
Light Pole, Tenon Mount and Twin Mount, 9 m – 12 m (30 - 40 ft)	21 kg/m (14 lb/ft)
Light Pole, Tenon Mount and Twin Mount, 13.5 m – 16.5 m (45 - 55 ft)	31 kg/m (21 lb/ft)
Light Pole w/Mast Arm, 9 m – 15.2 m (30 - 50 ft)	19 kg/m (13 lb/ft)
Light Pole w/Mast Arm, 16.5 m – 18 m (55 - 60 ft)	28 kg/m (19 lb/ft)
Light Tower w/Luminaire Mount, 24 m – 33.5 m (80 - 110 ft)	46 kg/m (31 lb/ft)
Light Tower w/Luminaire Mount, 36.5 m – 42.5 m (120 - 140 ft)	97 kg/m (65 lb/ft)
Light Tower w/Luminaire Mount, 45.5 m – 48.5 m (150 - 160 ft)	119 kg/m (80 lb/ft)
Metal Railings (excluding wire fence)	
Steel Railing, Type SM	95 kg/m (64 lb/ft)
Steel Railing, Type S-1	58 kg/m (39 lb/ft)
Steel Railing, Type T-1	79 kg/m (53 lb/ft)
Steel Bridge Rail	77 kg/m (52 lb/ft)
Frames and Grates	
Frame	115 kg (250 lb)
Lids and Grates	70 kg (150 lb)

RETURN WITH BID

**ILLINOIS DEPARTMENT
OF TRANSPORTATION**

**OPTION FOR
STEEL COST ADJUSTMENT**

The bidder shall submit this form with his/her bid. Failure to submit the form shall make this contract exempt of steel cost adjustments. After award, this form, when submitted shall become part of the contract.

Contract No.: _____

Company Name: _____

Contractor's Option:

Is your company opting to include this special provision as part of the contract plans?

Yes No

Signature: _____ **Date:** _____

80127

INDEX
FOR
SUPPLEMENTAL SPECIFICATIONS
AND RECURRING SPECIAL PROVISIONS

Adopted January 1, 2004

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

ERRATA Standard Specifications for Road and Bridge Construction
(Adopted 1-1-02) (Revised 1-1-04)

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STATE OF ILLINOIS

SPECIAL PROVISIONS

The following Special Provisions supplement the "Standard Specifications for Road and Bridge Construction," adopted January 1, 2002, the latest edition of the "Manual on Uniform Traffic Control Devices for Streets and Highways," and the "Manual of Test Procedures for Materials" in effect on the date of invitation for bids, and the Supplemental Specifications and Recurring Special Provisions indicated on the Check Sheet included herein which apply to and govern the construction of FAI 90/94 (I-90/94), Section 2004-099TS, Project IM-094-3(370)058 County: Cook and in case of conflict with any part or parts of said Specifications, the said Special Provisions shall take precedence and shall govern.

LOCATION OF PROJECT

The project extends along 63rd Street from approximately 85 feet west of Wells Street baseline to approximately 35 feet east of Wentworth Avenue baseline in the City of Chicago, in Cook County.

DESCRIPTION OF PROJECT

The project consists of traffic signal modernizations and roadway street lighting improvements along 63rd Street between S. Wentworth Avenue and S. Wells Street.

UTILITY COORDINATION - CITY OF CHICAGO

Effective: September 30, 1985

Revised: November 1, 1996

The City of Chicago is to make adjustments to their street lighting and/or traffic signal facilities. The Contractor shall coordinate his work and cooperate with the City of Chicago in these adjustments.

This coordination and cooperation by the Contractor will not be paid for separately but shall be considered included in the costs of the contract.

COMPLETION DATE PLUS GUARANTEED WORKING DAYS

The Contractor shall complete all contract items and safely open all roadways to traffic by 11:59 PM on, November 23, 2005 except as specified herein.

Article 108.09 of the Standard Specifications 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.

COORDINATION WITH ADJACENT AND/OR OVERLAPPING CONTRACTS

This Contract abuts and/or overlaps with other concurrent Contracts as listed below. Each Contract includes work items requiring close coordination between the Contractors regarding the sequence and timing for the execution of such work items.

Contract Number 62693
Contract Number 62835
Contract Number 62836
Contract Number 62842

Supplemental to the requirements of the Standard Specifications Article 105.08-Cooperation Between Contractors, the Contractors shall identify all such work items at the beginning of the Contract, and coordinate sequence and timing for their execution with the other Contractors through the Engineer. These work items shall be identified as separate line items in the Contractors' proposed Construction and Progress Schedule. Any conflicts between Contractors' schedules, the Department will be consulted through the Engineer to determine a resolution. Additional compensation or extension of the contract time will not be allowed for work and/or progress and/or lack of progress affected by lack of such coordination by the Contractor.

CONTRACTOR COOPERATION

The Contractor's attention is directed to the fact that other separate contracts may be under construction during the duration of this Contract and that the Contractor will be governed by Article 105.08 of the Standard Specifications.

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

No additional compensation will be allowed the Contractor for the above requirements or for any delays or inconvenience resulting from the activities of other contractors.

TRAFFIC CONTROL PLAN

Effective: September 30, 1985

Revised: October 1, 1995

Traffic Control shall be in accordance with 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.

HIGHWAY STANDARDS

701701	Urban Lane Closure Multilane Intersection
701801	Lane Closure Multilane 1W or 2W Crosswalk or Sidewalk Closure
702001	Traffic Control Devices

PLANS AND DETAILS

TC-22	Temporary Information Signing
-------	-------------------------------

RECURRING SPECIAL PROVISIONS AND SPECIAL PROVISIONS

Advanced Public Notification
Flagger Vests (BDE)
Personal Protective Equipment (BDE)
Temporary Concrete Barrier (BDE)
Temporary Information Signing
Traffic Control Deficiency Deduction (BDE)
Work Zone Traffic Control Devices (BDE)

ADVANCED PUBLIC NOTIFICATION

The Contractor shall provide notice to the public a minimum of 14 days in advance of any work that requires the closure of lanes or ramps through the use of a changeable message sign or temporary information signing.

TEMPORARY INFORMATION SIGNING

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

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

	<u>Item</u>	<u>Article/Section</u>
a)	Sign Base (Notes 1 & 2)	1090
b)	Sign Face (Note 3)	1091
c)	Sign Legends	1092
d)	Sign Supports	1093
e)	Overlay Panels (Note 4)	1090.01

- Note 1. The Contractor may use 16mm (5/8 inch) instead of 19mm (3/4 inch) thick plywood.
- Note 2. Type A sheeting can be used on the plywood base.
- Note 3. All sign faces shall be Type A except all orange signs shall meet the requirements of Article 1084.02(b).
- Note 4. The overlay panels shall be 2mm (0.08 inch) thick.

GENERAL CONSTRUCTION REQUIREMENTS

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

Signs which are placed along the roadway and/or within the construction zone shall be installed according to the requirements of Article 702.05 and Article 720.04. The signs shall be 2.1m (7') above the near edge of the pavement and shall be a minimum of 600mm (2') beyond the edge of the paved shoulder. A minimum of 2 posts shall be used.

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

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

Method of Measurement. This Work shall be measured for payment in square feet edge to edge (horizontally and vertically).

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

Basis of Payment. This Work will be paid for at the contract unit price per square feet for TEMPORARY INFORMATION SIGNING, which price shall be full compensation for all labor, equipment and materials required for performing the work as herein specified.
(CTE – 10/15/2004)

CHANGEABLE MESSAGE SIGNS

This item shall conform to the Recurring Special Provision for "Portable Changeable Message Signs:

Four (4) signs will be required for this contract.

CONSTRUCTION AIR QUALITY - DUST CONTROL

Description. This work shall consist of developing and implementing a detailed Dust Control Plan (DCP). Development of a DCP is required in "Non-attainment" and "Maintenance" areas, per Article 107.36 of the Standard Specifications. All construction activities shall be governed by the DCP. The nature and extent of dust generating activities, and specific control techniques appropriate to specific situations shall be discussed at the pre-construction meeting, with subsequent development of the DCP to include but not be limited to the requirements below.

The Contractor is responsible for the control of dust at all times during the duration of the contract, 24 hours per day, 7 days per week, including non-working hours, weekends, and holidays. This work shall be considered complete after the completion of all permanent erosion control measures required for the contract, and after all temporary and permanent seeding has taken place. Work on this contract shall be conducted in a manner that will not result in generating excessive air borne particulate matter (PM) or nuisance dust conditions.

The DCP shall include legible copies of the product literature and Material Safety Data Sheets for dust suppression agents and stabilizers the contractor proposes to use. The Dust Control Plan shall involve the implementation of control measures before, during and after conducting any dust generating operation. These controls must be in place on non-working days and after working hours, not just while work is being done on the site. The Dust Control Plan must contain information specific to the project site, proposed work, and dust control measures to be implemented. A copy of the Dust Control Plan must be available on the project site at all times.

The Dust Control Plan must contain, at a minimum, all of the following information:

Name, address and phone number of the person(s) responsible for the dust generating operation and for the submittal and implementation of the Dust Control Plan.

A drawing specifying the site boundaries of the project with the areas to be disturbed, the locations of the nearest public roads, and all planned exit and entrance locations to the site from any paved public roadways.

Control measures to be applied to all actual and potential fugitive dust sources before, during and after conducting any dust generating operation, including non-work hours and non-work days.

A list of dust suppressants to be applied, including product specifications, Material Safety Data Sheets, and product label instructions that include the method, frequency and intensity of applications; and information on the environmental impacts and approval or certifications related to the appropriate and safe use for ground applications.

A contingency plan consisting of at least one contingency measure for each activity occurring on the site in case the primary control measure proves inadequate.

The Contractor shall submit two copies of the DCP that outlines in detail the measures to be implemented by the Contractor complying with this section, including prevention, cleanup, and other measures at least 14 days before beginning any dust generating activity. The Contractor shall not begin any dust generating activities until the Engineer approves the DCP in writing. Failure to comply with the DCP or provisions herein will subject the contractor to an "Environmental Deficiency Deduction," as outlined below.

Materials

1. Dust Suppression Agents

Dust suppression agents shall be water soluble, non-toxic, non-reactive, non-volatile, and non-foaming. The use of petroleum for dust control is prohibited.

Calcium Chloride shall conform to the requirements of Article 1013.01 of the Standard Specifications. Other commercially available dust suppression agents may be substituted for calcium chloride subject to the approval of the Engineer. Material Safety Data Sheets must be reviewed and approved by the Engineer prior to the use of any substances other than Calcium Chloride.

Water shall meet the requirements of Article 1002 of the Standard Specifications.

2. Soil stabilizers shall consist of seed and mulch meeting the requirements of Article 1081.06 (a) (2) and (3).

3. Covers for stockpiles shall be commercially available plastic tarps, or other materials approved by the Engineer.

Construction Methods. Dust suppression agents shall be used to provide temporary control of dust on haul roads and other active work areas. Several applications per day may be necessary to control dust depending upon meteorological conditions and work activity. The Contractor shall apply dust suppression on a routine basis as necessary or as directed by the Engineer to control dust. Wet suppression consists of the application of water or a wetting agent in solution with water. Wetting agents shall not be applied directly to live plant material. Wet suppression equipment shall consist of sprinkler pipelines, tanks, tank trucks or other devices approved by the Engineer, capable of providing a regulated flow, uniform spray and positive shut off.

Calcium chloride dust suppression agents may be used in lieu of wet suppression only when freezing conditions exist. Calcium chloride shall be uniformly applied by a mechanical spreader at a rate of 1 and 1/2 pounds per square yard or its equivalent liquid, unless otherwise directed by the Engineer. Calcium chloride shall not be directly applied to live plant material.

Calcium chloride must not be stored outdoors without an impermeable cover. Storage must be on an impermeable surface such as paved asphalt or appropriately treated concrete of sufficient thickness to avoid exfiltration. Storage should be as airtight as possible to limit the calcium chloride's absorbing moisture from the air. No storage facilities will be allowed within 100 feet of a storm sewer, or any other drain. Positive drainage must be maintained on all treated surfaces. Ditches, culverts and other structures must be kept clean to ensure proper drainage and to limit the amount of water infiltrating earth surfaces and thereby leeching out chlorides. If calcium chloride is applied dry, or during dry periods, and crystals are seen on the road surface, the road should be wetted sufficiently to dissolve the calcium chloride. Wetting should be limited to an amount that will sufficiently cause the calcium chloride to penetrate the surface but not to the point of causing any runoff from the road surface. Other approved dust suppression agents shall be applied and used as per the manufacturer's instructions.

Haul truck cargo areas shall be securely covered during the transport of materials on public roadways that are prone to cause dust.

Public Roadway Dust Control. Track out, including carryout and spillage of material that adheres to the exterior surfaces of or are spilled from motor vehicles and/or equipment and subsequently fall onto a

paved public roadway must be controlled at all times. Clean up of carryout and spillage is required immediately if it extends a cumulative distance of 50 feet or more on a paved public roadway. If the extent of carryout is less than 50 feet, clean up at the end of the day is permissible. Clean up of paved surfaces shall be by wet spray power vacuum street sweeper. Dry power sweeping is prohibited.

Control of earthwork dust. During batch drop operations (i.e. earthwork with a front-end loader, clamshell bucket, or backhoe), the free drop height of excavated or aggregate material shall be reduced to minimum heights as necessary to perform the specified task, and to minimize the generation of dust. To prevent spills during transport, a minimum of 2 inches of freeboard space shall be maintained between the material load and the top of the truck cargo bed rail. A maximum drop height of two feet (or minimum height allowed by equipment) will be allowed, or to heights as directed by the Engineer.

Control of dust on stockpiles and inactive work areas. The Contractor shall use the following methods to control dust and wind erosion of stockpiles and inactive areas of disturbed soil:

Dust suppression agents shall be used during active stockpile load-in, load-out, and maintenance activities.

Soil stabilizers (hydraulic or chemical mulch) shall be applied to the surface of inactive stockpiles and other inactive areas of disturbed soil. Final grading and seeding of inactive areas shall occur immediately after construction activity is completed in an area and as directed by the Engineer.

Plastic tarps may be used on small stockpiles, secured with sandbags or an equivalent method approved by the Engineer, to prevent the cover from being dislodged by the wind. The Contractor shall repair or replace the covers whenever damaged or dislodged at no additional cost.

Method of Measurement. All measuring devices shall be furnished by the Contractor and approved by the Engineer.

Calcium chloride and other approved dust suppression agents shall be mixed with water at the rate specified by the manufacturer and measured for payment in units of 1000 Gallons of solution applied.

The application of soil stabilizers shall be measured by weight (pounds) of soil stabilizer. The soil stabilizer will then be added to water to form a solution in accordance with the manufacturer's recommendation.

All other dust control measures will not be measured for payment.

Basis of Payment. The application of dust suppression agents shall be paid for at the contract unit price per unit for **APPLYING DUST SUPPRESSION AGENT**.

Soil stabilizers will be paid for at the contract price per pound for **SOIL STABILIZERS**.

All other dust control measures will not be paid for directly but shall be considered as included in the various items involved and no additional compensation will be allowed.

CONSTRUCTION AIR QUALITY–DIESEL VEHICLE EMISSIONS CONTROLS

Description. The reduction of emissions of Carbon Monoxide (CO), Hydrocarbons (HC), Nitrogen oxides (NOx), and Particulate Matter (PM) will be accomplished by installing Retrofit Emission Control Devices and/or by using cleaner burning diesel fuels. The term "equipment" refers to any and all diesel fuel powered devices rated at 50 Horse power (HP) and above, to be used on the project site for any length of time, (including any "rented" or "rental" equipment).

All Contractor and Sub-contractor diesel powered equipment with engine horsepower (HP) ratings of 50 HP and above, that are on the project or are assigned to the contract shall be prohibited from using "off-road" diesel fuel (above 500 parts per million (ppm) sulfur content) at any time. In addition, diesel powered equipment shall be either (1) retrofitted with Emissions Control Devices *and* use Cleaner burning "on-road" diesel fuel (500 ppm sulfur content or less), or (2) use Ultra Low Sulfur Diesel fuel (ULSD) exclusively (15 ppm sulfur content or less), in order to reduce diesel particulate matter emissions. Large cranes (Sky cranes or Link Belt cranes), which are responsible for critical lift operations are exempt from installing Retrofit Emission Control Devices if they adversely affect equipment operation.

In addition, all construction motor vehicles (both on-road and off-road, gasoline or diesel fuel powered) shall comply with all pertinent State and Federal regulations relative to exhaust emission controls and safety, including opacity. Frequently Asked Questions (FAQ's) regarding Illinois Environmental Protection Agency (IEPA) emissions testing for gasoline powered vehicles can be accessed at (www.epa.state.il.us/air/vim/faq/testing.html). Regulations regarding diesel powered vehicles over 16,000 pounds, and the Diesel Emission Inspection Program (Title 92: Transportation Part 460, Diesel Emission Inspection Program, Subpart A: General) can be accessed at (www.dot.state.il.us/regulations.html). Diesel powered vehicles less than 16,000 pounds are exempt from testing by IDOT. All diesel powered equipment used on the project site shall be subject to reasonable, random spot checks for compliance with the required emissions controls and proper diesel fuel usage. The Secretary of State, Illinois State Police and other law enforcement officers shall enforce Part 460. For additional information concerning Illinois diesel emission inspection requirements, please call the Illinois Department of Transportation, Diesel Emission Inspections Unit, at 217-557-6081.

The Retrofit Emission Control Devices shall consist of oxidation catalysts, or similar retrofit equipment control technology that (1) is included on the Environmental Protection Agency (EPA) *Verified Retrofit Technology List* (www.epa.gov/otaq/retrofit/retroverifiedlist.html) and (2) is verified by EPA or certified by the manufacturer via letter, to provide a minimum emissions reduction of 20% PM10, 40% CO, and 50% HC when used with "on-road" diesel fuel. As noted above, the Retrofit Emission Control Device *must be used with on-road diesel fuel* (500 ppm sulfur content or less).

If used, ULSD fuel shall conform to American Society for Testing and Materials (ASTM) D-975 diesel with the following additional specifications:

ASTM D-5453 15 ppm Sulfur max.
ASTM D-6078 Lubricity (SBOCLE) 3100 g min.
ASTM D-613 Cetane 45 min.
Dyed (for Off-road use)

Construction shall not proceed until the contractor submits a certified list of the diesel powered equipment that will be retrofitted with emission control devices and use "on-road" diesel fuel, and a list of equipment that will use ULSD fuel only. The list(s) shall include (1) the equipment number, type, make, and contractor/sub-contractor name; (2) the emission control devices make, model and EPA verification number; and (3) the type and source of clean fuels to be used. Vehicles reported as fitted with emissions control devices shall be made available to the Engineer for visual inspection of the device installation by qualified staff, prior to being used on the project site. 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 under "Environmental Deficiency Deduction."

The contractor shall submit monthly summary reports, updating the list of construction equipment, and include certified copies of the diesel fuel delivery slips (for both "on-road" and ULSD) for the reporting time period, noting the type of diesel fuel used with each piece of diesel powered equipment. The addition or deletion of any diesel powered equipment shall be included in the summary and noted on the monthly report.

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 given 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. Failure to comply with the "Diesel Vehicle Emission Controls", shall also subject the Contractor or sub-contractor to an "Environmental Deficiency Deduction," as outlined below.

Any costs associated with bringing any diesel powered equipment into compliance with these "Diesel Vehicle Emissions Controls" shall be included in the overall cost of the contract. In addition, there shall be no time granted to the contractor for compliance with this notice. The contractor's compliance with this notice and any associated regulations shall also not be grounds for a claim.

A. IDLING. The contractor shall establish truck-staging areas for all diesel powered vehicles that are waiting to load or unload material at the contract area. Such zones shall be located where the diesel emissions from the equipment will have a minimum impact on adjacent abutters and sensitive receptors of the general public. The Department will coordinate such locations with the Contractor and City Of Chicago authorities, including local aldermen, in the selection of staging areas, whether within or outside the existing highway right-of-way (ROW), 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. Idling of diesel powered equipment shall not be permitted during periods of non-active vehicle use. Diesel powered engines shall not be allowed to idle for more than five consecutive minutes when the equipment is not in use, occupied by an operator, or otherwise in motion, except only as follows:

When the equipment is forced to remain motionless because of traffic conditions or mechanical difficulties over which the operator has no control;

When it is necessary to operate auxiliary systems installed on the equipment, only when such system operation is necessary to accomplish the intended use of the equipment;

To bring the equipment to the manufacturer's recommended operating temperature;

When the outdoor temperature is below forty-five (45) degrees Fahrenheit or above eighty (80) degrees Fahrenheit;

When the equipment is being repaired.

All work shall be conducted to ensure that no harmful effects are caused to adjacent sensitive receptors. Equipment and equipment operators found in non-compliance with these idling provisions shall receive a warning, and on the next offense be subject to an Environmental Deficiency Deduction as outlined below. The contractor or sub-contractor may reserve the right to enforce this deduction on their own equipment operator, as necessary.

B. MITIGATION. Air quality monitoring will be conducted throughout the course of the Dan Ryan reconstruction project, by a separate air quality consultant. The contractor shall designate a point person to be responsive to IDOT in the event construction related air quality issues arise. If the ongoing monitoring detects an adverse air quality issue that is due to, or exacerbated by construction activities, the contractors point person will be required to consult with the Engineer, to determine the appropriate course of action.

Appropriate mitigation measures can include a variety of actions ranging from, but not limited to additional watering, removal of construction equipment from nearby sensitive receptors, shut down of diesel powered equipment, or other mitigation measures which may be required as data becomes available and as approved by the Engineer.

Method of Measurement and Basis of Payment:

The **CONSTRUCTION AIR QUALITY – DIESEL EMISSIONS CONTROLS** will not be measured for payment and the cost of this work shall be included in the unit prices bid and no additional compensation will be allowed.

CONSTRUCTION NOISE MITIGATION

Description. This work shall consist of implementing construction noise restrictions as outlined in a project Construction Noise Mitigation plan. Work on the project shall be in accordance with the Construction Noise Mitigation plan submitted by the contractor, applicable sections of Article 107.35 of the Standard Specifications, and modifications as contained herein for construction noise.

The contractor must provide advance notification, and secure approval from the Engineer prior to the use of heavy construction equipment outside normal construction work hours ("normal construction work hours" as specified in Article 107.35 of the Standard Specifications). Inspection and maintenance of all vehicle exhaust systems shall be conducted on a monthly basis, (or as determined by the Engineer), for all such vehicles and other equipment assigned to or utilized on the project site. Inspections shall be conducted by personnel having a working knowledge of exhaust systems so that proper recommendations regarding the adequacy of the mufflers can be established.

Construction Equipment

Pavement Breakers create high concentrations of low frequency sound energy, and noise attenuation can be achieved through the introduction of high-mass material between the noise source and the receiver. The attachment of shrouds (sound curtains) to the steel frame around the breaker shall be installed, as equipment allows. The operation of pavement breakers shall be prohibited outside of normal work hours, as specified herein, unless otherwise approved by the Engineer.

Special care shall be taken with respect to the set up and operation of concrete batch and concrete crushing plants to minimize the potential noise impacts to the adjacent community. The Department will work with the Contractor and City Of Chicago authorities, including local aldermen in selecting construction concrete batch and/or crushing locations, whether within or outside the ROW, to avoid locations near sensitive areas or populations to the extent possible. All local, City, Village, Town and/or Township rules, regulations, and/or requirements regarding batch and crushing plants shall be followed, as instructed by the Engineer.

Compressors or generators shall be located as far away as possible from sensitive receptors. Compressors and generators shall be positioned such that the coding fan intake does not point towards the community. The Contractor shall review stationary equipment placement with the Engineer prior to commencement of work.

Method of Measurement and Basis of Payment:

The **CONSTRUCTION NOISE MITIGATION** will not be measured for payment and the cost of this work shall be included in the unit prices bid and no additional compensation will be allowed.

ENVIRONMENTAL DEFICIENCY DEDUCTION

To ensure a prompt response to incidents involving the integrity of work zone Environmental (Air Quality and Noise) Control, the Contractor shall provide a telephone number where a responsible individual can be contacted on a 24 hour a day basis.

When the Engineer is notified, or determines 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 frame. The specified time frame, 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.

The deficiency may include lack of repair, maintenance or non-compliance with the Special Provisions for Construction Air Quality Dust Control and/or Construction Noise Mitigation.

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 exists. The calendar day(s) will begin with Contractor's notification and end with the Engineer's acceptance of the correction. The daily monetary deduction will be either \$1,000.00 or 0.05 percent of the awarded contract value, whichever is greater.

In addition, if the Contractor or sub-contractor fails to respond within the allotted time frame, the Engineer may take action to correct the deficiency, or may cause the correction of the deficiency to be made by others, the cost thereof being deducted from monies due or which may become due the Contractor or sub-contractor. This corrective action will in no way relieve the Contractor or sub-contractor of his/her contractual requirements or responsibilities, and shall not be grounds for any claim.

If a Contractor or sub-contractor accumulates three (3) Deficiency Deductions for the same deficiency, in a contract period, the contractor will be shut down until the deficiency is corrected. Such a shut down will not be grounds for any extension of the completion date, waiver of penalties, or be grounds for any claim.

CONTRACTOR OFF-STREET PARKING RESTRICTION

The Contractor and all employees working on this project will not be allowed to park their vehicles and equipment on frontage roads or streets. The Contractor shall provide off-street parking facility for all vehicles and equipment. The Contractor shall also provide any transportation required to get his employees to and from the work site. The Contractor will provide the RE with written documentation of the off-site parking location.

The cost to comply with this requirement will not be paid for separately, but shall be considered as included in the contract unit bid prices of the contract, and no additional compensation will be allowed.

RAILROAD PROTECTIVE LIABILITY INSURANCE

Description. The Contractor will be required to carry Railroad Protective Liability and Property Damage Insurance in accordance with Article 107.11 of the Standard Specifications. The limits of liability shall be in accordance with Article 107.11 for the Standard Specifications unless otherwise noted. A separate policy is required for each railroad indicated below unless otherwise noted.

<u>NAMED INSURED & ADDRESS</u>	<u>NUMBER & SPEED OF PASSENGER TRAINS</u>	<u>NUMBER & SPEED OF FREIGHT TRAINS</u>
Chicago Transit Authority (CTA) 120 North Racine Avenue Chicago, IL 60607	M-F 382 trains/day at 55 mph	0
	Sat 338 trains/day at 55 mph	0
	Sun 356 trains/day at 55 mph	0

For Freight/Passenger and Insurance Information, please contact the CTA Representative, Mr. Marvin A. Watson (312) 681-3860

Basis of Payment: The costs for providing insurance, as noted above, will be paid for at the contract unit price per Lump Sum for RAILROAD PROTECTIVE LIABILITY INSURANCE.

APPROVAL OF INSURANCE: The ORIGINAL* and one CERTIFIED copy of each required policy shall be submitted to ENGINEER OF DESIGN, ILLINOIS DEPARTMENT OF TRANSPORTATION, 2300 SOUTH DIRKSEN PARKWAY, SPRINGFIELD, ILLINOIS 62764 for approval. The Contractor will be advised when the Department has received approval of the insurance from the railroad(s). Before any work begins on railroad right-of-way, the Contractor shall submit to the Resident Engineer evidence that the required railroad protective liability insurance has been approved by the railroad(s). The Contractor shall also provide the Resident Engineer with expiration date of each required policy.

*An additional original or required policy shall be submitted to the CTA.

MAINTAIN EXISTING LIGHTING SYSTEM

Description. This item consists of furnishing all labor, equipment, and incidental materials for maintaining existing City of Chicago street lighting systems until the proposed new equipment is installed, energized, tested, and accepted for operation by the Engineer.

The work shall include necessary temporary devices to maintain existing illumination. The location and protection devices necessary to comply with these requirements will be subject to the approval of the Engineer.

The work shall also include temporary wire or cable which may be required to be installed overhead between existing poles or temporary devices to maintain existing service until the proposed lighting equipment is installed, tested, and accepted for operation by the Engineer.

Coordination Requirements for Existing and Temporary Lighting with Other Contracts. The Contractor shall coordinate maintenance of existing and temporary lighting with the sequence of construction and maintenance of traffic for this project and IDOT Contract No. 62693 – Reconstruction of Frontage Roads, Retaining Walls, and Ramps Between 63rd Street and 59th Street.

The Contractor shall become familiar with the construction schedules and maintenance of traffic for Contract No. 62693. Work shall be coordinated between the Contracts such that none of the Contracts' schedules are delayed. Failure by the Contractor to coordinate with the other Contracts' construction schedule will be grounds for a deficiency deduction of \$500.00 for each and every occurrence, to be deducted from the next pay estimate due to the Contractor.

General Requirements. Perform work in accordance with Section 801 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

The Contractor shall MAINTAIN EXISTING LIGHTING SYSTEMS (temporary and permanent) and proposed lighting systems, including receptacles and other ancillary devices connected to the applicable street lighting controllers. Effective the day the Contractor is directed by the Engineer to assume responsibility for maintenance of the existing lighting system, the Contractor shall maintain the existing lighting equipment located within the project limits as it then exists.

Materials. Materials shall be according to the applicable Bureau of Electricity (BOE) Specifications and Articles of Standard Specifications Section 1000-Materials as noted elsewhere in these Specifications.

Maintenance Preconstruction Inspection. Before performing any excavation, removal, or installation work (electrical or otherwise) at the site, the Contractor shall request a maintenance preconstruction site inspection, to be held in the presence of the Engineer and a representative of the party or parties responsible for maintenance of any lighting and/or traffic control systems which may be affected by the work. The request for the maintenance preconstruction inspection shall be made no less than seven (7) calendar days prior to the desired inspection date. The maintenance preconstruction inspection shall:

Establish the procedures for formal transfer of maintenance responsibility required for the construction period, and establish the approximate location and operating condition of lighting and/or traffic control systems which may be affected by the work.

Marking of Existing Cable Systems. The party responsible for maintenance of any existing lighting and/or traffic control systems at the project site will, at the Contractor's request, mark and/or stake, once per location, all underground cable routes owned or maintained by the City. A project may involve multiple "locations" where separated electrical systems are involved (i.e. different controllers). The markings shall be taken to have a horizontal tolerance of at least one (1) foot to either side. The request for the cable locations and marking shall be made at the same time the request for the maintenance preconstruction inspection is made. The Contractor shall exercise extreme caution where existing buried cable runs are involved. The markings of existing systems are made strictly for assistance to the Contractor and does not relieve the Contractor of responsibility for the repair or replacement of any cable run damaged in the course of the work, as specified elsewhere herein. NOTE THAT THE CONTRACTOR WILL BE ENTITLED TO ONLY ONE REQUEST FOR LOCATION MARKING OF EXISTING SYSTEMS AND THAT MULTIPLE REQUESTS MAY ONLY BE HONORED AT THE CONTRACTOR'S EXPENSE. NO LOCATES WILL BE MADE AFTER MAINTENANCE IS TRANSFERRED, UNLESS IT IS AT THE CONTRACTOR'S EXPENSE.

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

Damage to Electrical Systems. Delete the last paragraph of Article 801.06 of the Standard Specifications.

Lighting Operation and Maintenance Responsibility. The scope of work includes the assumption of responsibility for the continuing operation of existing, temporary or other lighting systems and all appurtenances affected by the work as may be specified elsewhere herein. Existing lighting systems, when depicted on the plans, are intended only to indicate the general equipment installation of the systems involved and shall not be construed as an exact representation of the field conditions. It remains the Contractor's responsibility to visit the site to confirm and ascertain the exact extent of the electrical equipment and systems to be maintained. Where there is existing lighting within the project limits, prior to the start of activities at the site, the Contractor shall schedule a formal transfer of maintenance via the Engineer, however failure to do so does not relieve the Contractor of the maintenance responsibility specified herein and such failure obligates the Contractor to correct deficiencies in the existing system at his own expense.

Effective the date the Contractor's activities (electrical or otherwise) at the job site begin, the Contractor will be responsible for the proper operation and maintenance of all existing lighting systems which may be affected by the work for which maintenance has been transferred to the Contractor and all temporary and newly constructed lighting systems under this Contract, until final acceptance or as otherwise determined by the Engineer.

Except as specified herein, the Contractor's responsibility will include all applicable responsibilities of the City of Chicago, Department of Streets and Sanitation. These responsibilities will include lighting units (including underpass and navigational lighting), cable runs and lighting controls.

Electrical System Damage Response. The Contractor shall respond to damage calls for all system components being maintained and/or installed by the Contractor, existing and proposed, including, but not limited to pole knockdowns, circuit outages, more than 3 luminaires on a circuit, 3 successive luminaires, and controller outages within one hour after notification and provide immediate corrective action. The Contractor shall also repair other outages within 5 days. The Contractor shall maintain in stock a sufficient amount of material and equipment to provide temporary and permanent repairs. Any damage to the lighting system from any cause whatsoever shall be repaired or replaced in kind with equipment in the same condition before the incident or with new equipment provided by the Contractor at no additional cost to the Contract, all as approved by the Engineer. If the Contractor fails to respond so as to produce immediate corrective action within the specified time frames, or fails to complete repairs in a timely manner the Engineer may direct other forces, such as the City's Maintenance Contractor, to perform the work. Charges incurred will be direct billed to the Contractor. The City will retain all rights to pursue claims against third parties in all situations regardless of who is maintaining the system. The Contractor shall also provide the City with all accident and damage reports from any incidents.

Weekly Night-time Patrols. Responsibilities shall also include weekly night-time patrol of the lighting system, with patrol reports filed immediately with the Engineer and with deficiencies corrected within 24 hours of the patrol. Patrol reports shall be presented on standard forms as designated by the Engineer. Uncorrected deficiencies may be designated by the Engineer as necessitating emergency repairs as described elsewhere herein. Failure to submit patrol reports on a weekly basis will result in a Penalty for Non-Compliance as specified herein.

Contractor's Responsibility. Existing lighting systems which may be affected by the work will include, as a minimum, all existing lighting units within the project limits and these units may be temporarily isolated by means of in-line waterproof fuse holders as approved by the Engineer. When a controller is to be replaced or modified under the Contract work, or where otherwise indicated, the controller and all systems connected to it shall be included in the Contractor's responsibility for proper operation of lighting systems. The Contract Drawings may indicate the general extent of any existing lighting, but whether indicated or not, it remains the Contractor's responsibility to ascertain the extent of effort required for compliance with these specifications and failure to do so will not be justification for extra payment or reduced responsibilities.

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

Coordination Requirements for Existing and Temporary Lighting. The Contractor shall coordinate maintenance of existing, temporary, and proposed lighting with the sequence of construction and maintenance of traffic for this Project.

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

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

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

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

Deficiency Deduction for Non-Compliance. The Contractor will be subject to a penalty of \$500.00 per incident, per day, to be deducted from next pay estimate due Contractor, for each occurrence when the Engineer determines that Contractor or his Subcontractor is not in full compliance with this Item of the Specifications.

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

Reimbursement. If the Contractor utilizes any lighting equipment owned by the City or uses existing ComEd service, the Contractor shall compensate the City for such usage.

Method of Measurement. MAINTAIN EXISTING LIGHTING SYSTEM will not be measured for payment.

Basis of Payment. This Work will be paid for at the contract lump sum price for MAINTAIN EXISTING LIGHTING SYSTEM.
(CTE – 10/29/2004)

PVC CONDUIT IN TRENCH

Description. This item consists of furnishing and installing conduits, fittings, and accessories, laid in trench as specified herein, as shown on the plans, and as directed by the Engineer.

Materials. Rigid Nonmetallic Conduit shall conform to Standard Specifications, Article 1088.01(b) Polyvinylchloride (PVC) conduit shall conform to the requirements of National Electrical Manufacturers Association Standard, Publication Number TC2 for Schedule 40 and Schedule 80 conduit.

General Requirements. General requirements shall be in accordance with Section 801 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Location. Conduits will be installed at locations as shown diagrammatically on the plans. Conduits shall be installed in the shortest practicable line between points of termination, or under adverse conditions, as directed by the Engineer. Conduits not shown on the plans, but necessary for installation, will be paid for at the contract unit price as additional units of construction.

Installation. Installation shall be in accordance with Article 810.03(b) of the Standard Specifications, except for paragraphs (4) and (5), which is revised to read as follows:

- "(4) All conduit runs shall be cleaned and swabbed before installation of electric cables. Crushed, obstructed or deformed conduit will not be accepted. The excavation for trenched conduit under pavement shall be located at least 24 inches from the face of curb unless noted otherwise on the plans. All underground conduit shall have a minimum depth of 30 inches below grade.
- (5) When multiple conduits in a common trench are required, no more than three (3) 4 inch or smaller conduits shall be laid on a single, horizontal level. Four (4) or more conduits shall be installed on two (2) levels as directed by the Engineer."

Method of Measurement. Conduit in trench will be measured for payment in feet as installed and accepted, in place. Measurements will be made in straight lines along the centerline of the conduit, horizontally, between changes in direction. Vertical conduit and sweeps installed in foundations will not be measured for payment.

Basis of Payment. This Work will be paid for at the contract unit price per foot for PVC CONDUIT IN TRENCH, of the size and type specified. Excavation and backfill is not included in this item and will be paid separately.

(CTE – 10/15/2004)

INNERDUCT IN CONDUIT, 1 1/4 INCH

Description. This item consists of furnishing and installing innerduct in existing or proposed conduit for the eventual placement of fiber optic cable, as shown on the plans or as directed by the Engineer.

Material. Fiber optic innerduct shall be flexible plastic such as polyethylene with a minimum bending radius not less than the minimum bending radius of the fiber optic cable which it supports.

The innerduct shall be orange in color for ease of identification, and shall have a preinstalled pull rope or pull tape to facilitate cable pulling. Where used, innerduct shall not include pre-installed fiber optic cable. Fiber optic cable shall be installed in the innerduct after the innerduct is installed.

The innerduct shall meet, as a minimum, the following specifications:

Nominal Outside Diameter:	1.580"
Nominal Inside Diameter:	1.25"
Minimum Tensile Strength:	4000 lbs.
Minimum Impact Resistance:	25 lbs.
Minimum Crush Resistance:	900 lbs.
Maximum Pull Load:	1200 lbs.

The innerduct shall be ribbed longitudinally along the interior and exterior of the innerduct to minimize friction during cable installation and to prevent spiraling of the innerduct during installation in the conduit. The inside of the innerduct shall have a permanent coat of silicone or equivalent compound during manufacture to reduce friction during the installation of the cable.

Installation. The innerduct shall be pulled into the conduit per the manufacturer's instructions. The innerduct shall be used to protect and isolate the fiber optic cable. The cable shall be installed separately under a different pay item.

Innerduct shall not run continuous through manholes, handholes, or vaults; but shall be terminated at each wall of structures using methods recommended by the manufacturer.

Method of Measurement. The innerduct will be measured per foot installed, and will include only horizontal distances as shown on the plans, or as directed by the Engineer.

Basis of Payment. This Work will be paid for at the contract unit price per foot for INNERDUCT IN CONDUIT, 1¼ INCH.

(CTE – 10/15/2004)

ROD AND CLEAN DUCT IN EXISTING CONDUIT SYSTEM

Description. This item consists 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 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 shall be no differentiation in cost for the size of the conduit.

Construction Requirements.

Cleaning: Prior to starting construction, an inspection of all the existing manholes, will be made by the Engineer and the Contractor to determine the amount of existing debris in these structures. Upon completion of the work, the Contractor shall clean debris due to construction. Cleaning of existing manholes will be paid under a separate item.

Prior to removal of the duct rod a duct cleaning attachment such as a properly sized wire brush or cleaning mandrel shall be attached to the duct rod, which shall be pulled through the conduit to remove sand, grit, or other light obstructions from the duct to provide a clean, clear passage for the installation of cable.

Whenever the installation of cables is not performed as an adjunct to or immediately following the cleaning of the duct, a light weight pulling line such as a 1/8" polyethylene line or conduit measuring tape shall be placed and shall remain in the conduit to facilitate future work.

When great difficulty of either inserting the duct rod or removal of the cleaning mandrel is encountered, the duct may require further cleaning by use of a compressed air gun, or a low pressure water hose.

In the case of a broken duct line, the conduit shall be excavated and repaired as part of the item REPAIR AND REPLACE DAMAGED CONDUIT.

Method of Measurement. This Work will be measured in lineal feet for each conduit cleaned. Measurements shall be made from point to point horizontally. Vertical rises will not be measured.

Basis of Payment. This Work will be paid for at the contract unit price per lineal foot for ROD AND CLEAN DUCT IN EXISTING CONDUIT SYSTEM. When the number of cables to be installed require the use of more than one conduit in the same run, each additional conduit required shall be rodded and cleaned as a separate unit and paid for at the contract unit price.

(CTE – 10/15/2004)

REPAIR AND REPLACE DAMAGED CONDUIT

Description. This item consists of the repair and replacement of short segments of damaged or crushed conduit, needed to complete rewiring of a signalized intersection, as directed by the Engineer. Work shall include excavation of pavement or sidewalk, trenching, repair and replacement of the affected conduit using water-tight conduit splices, backfill of the trench, and restoration of disturbed pavement and sidewalk.

The costs of sidewalk removal and replacement work, pavement removal and replacement, and trench and backfill work, when incurred under this item, will not be measured for payment but shall be included in this item.

Before commencing repair and replacement, the Contractor shall submit a brief statement of the expected work method and effort for each section of damaged or crushed conduit to the Engineer. The actual work shall not take place until the Engineer approves the Contractor submittal.

Method of Measurement. The work paid for will be the number of lineal feet of conduit repaired, replaced, and accepted, measured in place. The length for measurement will be the distance horizontally between changes in direction of the conduit plus the conduit vertically attached to structure.

Basis of Payment. This Work will be paid for at the contract unit price per lineal foot for REPAIR AND REPLACE DAMAGED CONDUIT.

(CTE – 10/15/2004)

INTERCEPT EXISTING CONDUIT

Description. This item consists 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.

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

Construction Requirements. The Contractor shall 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) shall be carefully split so that all working cables are not interrupted. If conduit(s) are concrete encased, such concrete shall be removed as required. Any concrete encasement damaged during installation shall be restored as needed. No additional compensation shall be made for additional concrete. This item shall 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 shall furnish all materials for a complete installation.

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

Basis of Payment. This Work will be paid for at the contract unit price per each for INTERCEPT EXISTING CONDUIT. No additional payment will be allowed for excavation, backfilling, and restoration of a parkway.
(CTE – 10/15/2004)

JUNCTION BOX, POLE OR POST MOUNTED

Description. This item consists of furnishing and installing a Junction Box on each traffic signal post, traffic signal pole, or street light pole on which a signal head is mounted, as shown on the plans or directed by the Engineer.

General Requirements. Perform work in accordance with Sections 801, 802, and 813 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials. The Junction Box shall conform to the requirements of BOE Material Specification 1407 and shall be mounted above and attached by four (4) #10-24x3/4" stainless steel screws, to a long sweep elbow, Leitelt Brothers Company Item Number LB-16-64-A-2, or equivalent. A stainless steel, sign mounting, banding bracket, BOE Drawing No. 11984, shall be attached to the center of the back of the box with a 5/16" x 1" stainless steel machine screw. The box shall contain a 20 conductor terminal strip, Marathon Special Products Corporation Catalog Number 36002, or equivalent, securely fastened to an Aluminum Terminal Block "Z" Bracket, Leitelt Brother Company Item Number LB-16-6-4B, or equivalent, mounted with two Number 8-24 x 1/2" stainless steel machine screws in tapped holes in the mounting bosses, and located 3/4 inches from the right side facing the open box.

Installation. The junction box, 16" high, 6" Wide and 4" deep shall be installed with appurtenances as shown on BOE Standard Drawing 834 and as described herein. The box and elbow shall be mounted on the side of the pole away from the roadway. The center of the box shall be located approximately fifty-eight inches (58") above the adjacent sidewalk. The long sweep elbow shall be properly positioned over a hole 1 1/2" in diameter drilled in the pole approximately 48" above the sidewalk, for the installation of the cable. The hole shall 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. The box and elbows shall be banded to the pole with three (3) 3/4" stainless steel bands, one through the banding bracket and one each at the top and bottom of the elbow. The banding and clips shall have a baked-on black finish.

Color. Color shall be black as indicated on the plans. Color shall conform to City of Chicago Standards. A color sample will be submitted to the Engineer for approval prior to fabrication.

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

Basis of Payment. This Work will be paid for at the contract unit price per each for a JUNCTION BOX, POLE OR POST MOUNTED. Connection of cables and wires to the terminal strip will not be part of the cost of the junction box but are included in the installation of underground cable and the installation of signal heads.
(CTE – 10/15/2004)

DRILL EXISTING MANHOLE OR HANDHOLE

Description. This item consists of core drilling or opening a hole in an existing handhole or manhole for the installation of new conduit(s).

General Requirements. Perform work in accordance with Section 879 of the Standard Specifications, in accordance with ComEd Standards for ComEd handholes or manholes, Bureau of Electricity Standards, and the City of Chicago Electrical Code for City electric handholes or manholes, except as herein modified.

Materials. Rigid Steel Conduit: BOE Material Specification 1462.

Installation. The size of the hole shall be as close as possible to the size of the conduit. A conduit stub-out of the size required shall be installed in the drilled hole. A bushing shall be provided at the end of the conduit. The space between the conduit and the handhole or manhole shall be sealed with a waterproof grout. The type and orientation of the conduit shall be as shown on the plans.

If a brick manhole or handhole is found where core drilling is not possible, then the Contractor shall break a hole using low impact pneumatic hammers so as to not damage the remaining structure. Conduit openings in the wall shall be plugged with mortar. The mortar shall seal the conduit openings effectively and as directed by the Engineer, and shall be finished flush with the inner surfaces of the wall.

Coordination with ComEd for ComEd handholes or manholes, and coordination with the Bureau of Electricity for City electric handholes or manholes shall be performed by the Contractor prior to starting work.

Cleaning the existing manhole or handhole is not included in this item and will be paid for under a separate pay item.

Method of Measurement. Each hole that is drilled for a conduit, or hole that is made for a bank of conduits (drilling the hole, furnishing and installing the conduit(s) and bushing(s), including all necessary excavation and backfilling outside of the handhole or manhole) as indicated will be counted as a unit for payment.

Basis of Payment. This Work will be paid for at the contract unit price each for DRILL EXISTING MANHOLE OR HANDHOLE.

(CTE – 10/29/2004)

CLEAN EXISTING MANHOLE OR HANDHOLE

Description. This item consists of cleaning existing manholes or handholes for the installation of new conduit(s) and cable(s) or as directed by the Engineer.

General Requirements. Perform work in accordance with Section 801 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Installation. Relocate existing cable hooks and retrain existing cables as required prior to drilling the existing manhole or handhole. Remove any accumulation of silt, debris or foreign matter of any kind and dispose of off-site by the Contractor. Gas and water shall be pumped out. Water shall be filtered prior to discharge to a catch basin.

Coordination with ComEd for ComEd manholes or handholes, and coordination with the Bureau of Electricity for city electric manholes or handholes shall be performed by the Contractor prior to starting any work.

Drilling the existing manhole or handhole is not be included in this item and will be paid for under a separate pay item.

Method of Measurement. Each manhole or handhole that is cleaned will be counted as a unit for payment. Each manhole or handhole that is drilled will be measured for payment for cleaning only once.

Basis of Payment. This Work will be paid for at the contract unit price per each for CLEAN EXISTING MANHOLE OR HANDHOLE.

(CTE – 10/15/2004)

RACKING CABLES IN MANHOLE OR HANDHOLE

Description. This item consists of furnishing and installing racks and racking fiber optic cable in split duct and/or traffic signal and lighting copper cable around the inside perimeter of a manhole as shown on the plans and as directed by the Engineer.

In each manhole, the Contractor shall furnish and install at least four support brackets attached to the manhole walls, on which neatly coiled fiber optic cable in split innerduct and copper cable can be secured. The support brackets shall be attached firmly by screws drilled into the wall. Specific racking layout and components shall be provided in a submittal to the Engineer for each manhole, for review and approval in advance of installation.

In the event that a cable enclosure or other protective treatment of cable is used in place of racking on brackets at the direction of the Engineer, such alternate treatment shall be paid for as this item.

Method of Measurement. This Work will be measured on a per each basis each for manhole or handhole racked.

Basis of Payment. This Work will be paid for at the contract unit price per each for RACKING CABLES IN MANHOLE OR HANDHOLE.

(CTE – 10/25/2004)

TRENCH AND BACKFILL WITH SCREENINGS AND/OR SAND

Description. This item consists of excavating a trench for the installation of cables or conduits, and backfilling with limestone screenings or bank sand in paved areas as shown on the plans and or as directed by the Engineer.

General Requirements. Perform work in accordance with Section 801, 802, and 815 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials.

Underground Cable Marking Tape: Standard Specifications, Article 1066.06.

Backfill Material: Standard Specifications, Article 1003.04.

CONSTRUCTION REQUIREMENTS

Add the following to 815.03 item (a):

“The bottom of the trench shall be tamped, and the trench inspected by the Engineer before cable or conduit is placed in the trench.”

Delete paragraphs 1 through 4 of item (b) of 815.03 and insert as follows:

“Conduit and cable shall not be installed by plowing in lieu of trench and backfill. Conduit or cable installation performed by the plow method will not be measured for payment.”

Add the following to item (c) of 815.03:

“All trenches shall 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 Engineer is satisfactory backfilling material, may be used for backfilling above the layer of limestone screenings or sand. The limestone screenings or sand shall be used to fill the bottom of the trench to a depth of 12 inches above the top of the conduit or cable. Cinders, rocks, or other inappropriate materials will not be permitted to be used as backfilling material.”

Method of Measurement. This Work will be measured in feet along the centerline of the trench, with conduit or cable in place and will include all conduit in trench installations regardless of conduit size.

Basis of Payment. This Work will be paid for at the contract unit price per foot, for TRENCH AND BACKFILL WITH SCREENINGS AND/OR SAND.

The costs for horizontal boring and disposal of all surplus excavated material shall be included in the cost of trench and backfill.

Horizontal boring made for the purpose of placing conduit or cable under pavement, sidewalks, tree roots, or driveways will be paid for at the contract unit price per foot and designated as TRENCH AND BACKFILL WITH SCREENINGS AND/OR SAND.

(CTE – 10/28/2004)

TRENCH AND BACKFILL WITH SCREENINGS AND/OR SOIL

Description. This item consists of excavating a trench for the installation of cables or conduits, and backfilling with limestone screenings or soil in unpaved areas as shown on the plans and or as directed by the Engineer.

General Requirements. Perform work in accordance with Section 801, 802, and 815 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

CONSTRUCTION REQUIREMENTS

Add the following to 815.03 item (a):

“The bottom of the trench shall be tamped, and the trench inspected by the Engineer before cable or conduit is placed in the trench.”

Delete paragraphs 1 through 4 of item (b) of 815.03 and insert as follows:

“Conduit and cable shall not be installed by plowing in lieu of trench and backfill. Conduit or cable installation performed by the plow method will not be measured for payment.”

Add the following to item (c) of 815.03:

“All trenches shall 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 Engineer is satisfactory backfilling material, may be used for backfilling above the layer of limestone screenings or sand. The limestone screenings or sand shall be used to fill the bottom of the trench to a depth of 12 inches above the top of the conduit or cable. Cinders, rocks, or other inappropriate materials will not be permitted to be used as backfilling material.”

Method of Measurement. This Work will be measured in feet along the centerline of the trench, with conduit or cable in place and will include all conduit in trench installations regardless of conduit size.

Basis of Payment. This Work will be paid for at the contract unit price per foot, for TRENCH AND BACKFILL WITH SCREENINGS AND/OR SOIL.

The costs for horizontal boring and disposal of all surplus excavated material shall be included in the cost of trench and backfill.

Horizontal boring made for the purpose of placing conduit or cable under tree roots will be paid for at the same contract unit price per foot and designated as TRENCH AND BACKFILL WITH SCREENINGS AND/OR SOIL.

(CTE – 10/28/2004)

ELECTRIC CABLE IN CONDUIT

Description. This item consists of furnishing, installing and testing single conductor power cable, complete with all splicing, identifications and terminations as specified herein, as shown on the plans and as directed by the Engineer. The cable shall be installed in conduit.

General Requirements. Perform work in accordance with Sections 801 and 817 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials. Materials shall be according to the Bureau of Electricity (BOE) Material Specification 1440.

Installation. Install in accordance with Article 817.03 of the Standard Specifications, with the following additional requirements.

Cable Damage. All cable shall be installed with care to prevent damage to the cable. The Contractor shall check the cable for defects as it is being installed. Any defects found shall be

reported to the Engineer, and shall be repaired to the satisfaction of the Engineer, or the cable replaced as directed by the Engineer.

Cable Racks. Cable passing through manholes (or handholes) shall be trained around the sides of the manhole into a permanent position on racks mounted on each manhole wall. Before racking and training new cables, the Contractor shall rack and train all existing cables. Racking and training of existing cables is not to be included in this item but will be included under a separate pay item. Allowance shall be made for cable expansion and contraction. 10 feet of slack cable per set shall be provided in manholes or handholes for all new installations.

The Contractor is responsible for furnishing and installing cable racks and/or cable hooks for new and existing cables in all manholes and handholes as required to facilitate the cable installation. This Work will not be included in this item but will be included under separate pay items.

Color Coded. The cable installation shall 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 smallest conductor or equipment grounding conductor shall always be color coded green.

Street Lighting Controller. All cable pulled into the street lighting controller cabinets shall be properly trained and shall have sufficient slack provided for any rearrangement or future addition of equipment.

Testing. After a cable installation is completed, but before connections to apparatus are made, the insulation resistance of the cable shall be measured by means of an approved 600 Volt MEGOHM tester. The insulation resistance of any cable measured as specified shall be not less than five megohms.

Triplexing. When triplexed conductors are specified, the smaller of the conductors must have a green colored jacket and the triplexed conductors must be triplexed with a 16"-18" lay. The jacket color must not be unduly affected by cable installation or prolonged exposure to either direct sunlight or moisture.

Cable Terminations or Splices. Where approved, shall be made in accordance with Article 1066.06. All connectors, insulating tapes and related materials shall be approved by the Engineer. Splices and terminations shall be included in the installation of cable. Separate payment will not be made.

Cleaning. When all cable installation has been completed in a manhole or handhole, the manhole or handhole shall be cleared of all debris and left in broom clean condition.

Method of Measurement. The cable will be measured for payment in feet in place. Measurements will be made horizontally, in straight lines between changes in direction and to the centers of equipment and box access points.

Vertical cable will be measured for payment. The vertical distance required for breakaway devices, foundations, concrete pedestals, etc., and the depth of any burial will be measured. Changes in direction will assume perfect straight line runs, ignoring actual raceway sweeps.

Measurements will not include waste ends of cable which may have to be cut off for making splices or connections to any material or apparatus. Ten feet of slack will be allowed where terminating cable at a lighting controller, or where routing cable through a manhole or handhole. Three feet of slack per set will be allowed at light poles, pull boxes, junction boxes, and similar locations.

Basis of Payment. This Work will be paid for at the contract unit price per foot for ELECTRIC CABLE IN CONDUIT or TRIPLEXED CABLE IN CONDUIT, of the size specified.
(CTE – 10/28/2004)

AERIAL CABLE REMOVAL

Description. This item consists of disconnecting and removing aerial cable with messenger wire where poles will remain as shown on the plans and as directed by the Engineer. The removal shall include removal of all mounting hardware, associated apparatus, and connections to the associated lighting controller, electric service pole or the last connection unaffected by the removal work.

Removal work will not be permitted without approval from the Engineer. Material removed as part of this item shall become the property of the Contractor and shall be removed from the site.

Method of Measurement. The removed aerial cable will be measured in feet in place and will be taken as the length of the messenger wire. Measurement will be made in a straight line between changes in direction and to the centers of poles and control cabinets. Sag of the aerial cable or vertical cable will not be measured for payment.

Basis of Payment. This Work will be paid for at the contract unit price per foot for AERIAL CABLE REMOVAL.

(CTE – 10/15/2004)

AERIAL CABLE WITH MESSENGER WIRE

Description. This item consists of furnishing, installing, and connecting aerial cable complete with all splicing, identifications, terminations, and secondary racks.

General Requirements. Perform work in accordance with Section 801, 802, and 818 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Furnish and install Secondary Racks per BOE Material Specification 1443 and as shown on the plans.

Where existing cable is to be abandoned in place, it shall be disconnected and reconnected to new aerial cable.

Method of Measurement. Secondary Racks will not be measured for payment and are included in the cost of this item.

Used cable will not be measured for payment and is included in the cost of this item.

The cost of disconnecting and abandoning in place existing cables feeding street, roadway, and underpass lighting, and reconnecting to the temporary lighting system will not be measured for payment and is included in the contract unit price for this item.

Basis of Payment. This Work will be paid for at the contract unit price per foot for AERIAL CABLE, WITH MESSENGER WIRE of the type, size, and number of conductors indicated.

(CTE – 11/03/2004)

GROUND ROD, 3/4" DIA. X 10.0'-0" LENGTH

Description. This item consists of furnishing, installing, and connecting ground rods for the grounding of service neutral conductors and for supplementing the equipment grounding system via connections at lighting units, manholes, handholes, street lighting controllers, and traffic signal controllers throughout the system.

General Requirements. Perform work in accordance with Sections 801, 806 and 807 of the Standard Specifications, Bureau of Electricity Standards, the City of Chicago Electrical Code, and Article 250 of the NEC, except as herein modified.

Materials.

Copper Ground Wire: BOE Specification No. 1440.

Ground Rod: BOE Specification No. 1465 and Standard Specifications, Article 1087.01.

Installation. Ground rods shall be driven so that the tops of the rod are 24 inches below finished grade, unless noted otherwise on the plans. Where indicated, ground rods shall be installed through concrete foundations or manholes. Where ground conditions, such as rock, preclude the installation of the ground rod, the ground rod may be deleted with the prior approval of the Engineer.

Ground rod connection shall be made by approved clamps. Ground wire for connection to foundation steel, or as otherwise indicated, shall be stranded uncoated bare copper, in accordance with the applicable requirements of ASTM Designation B-3 and ASTM Designation B-8 and shall be included in this item. Unless otherwise indicated, the wire shall not be less than No. 8 AWG.

The ground wire shall be interconnected to the ground rod, reinforcing steel and anchor bolts at each foundation. All connections to ground rods, structural steel and anchor bolts shall be made with approved clamp. Where such connections are made to insulated conductors, the connection shall be wrapped with at least 4 layers of electrical tape extended 6 inches onto the conductor insulation.

Method of Measurement. Ground rods will be counted per each in place. Ground wires and connection of ground rods at lighting units, manholes, handholes, controller foundations, and wall mounted controllers will not be measured for payment and are included in this pay item.

Basis of Payment. This Work will be paid for at the contract unit price each for GROUND ROD, of the diameter and length indicated.

(CTE – 10/28/2004)

CONDUIT IN TRENCH, GALVANIZED STEEL

Description. This item consists of furnishing and installing conduits, fittings, and accessories, laid in trench as shown on the plans and as directed by the Engineer. This item does not include excavation or backfill of the trench.

General Requirements. Perform work in accordance with Sections 801 and 810 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials. Rigid Steel Conduit shall conform to BOE Material Specification 1462.

Conduits will be installed at locations as shown diagrammatically on the Plans. Conduits shall be installed in the shortest practicable line between points of termination, or under adverse conditions, as directed by the Engineer. Conduits not shown on the Plans, but necessary for installation, will be paid for at the applicable bid unit price as additional units of construction.

Installation. Installation shall be in accordance with Article 810.03(a) of the Standard Specifications, except for paragraph (2), which is revised to read as follows:

- "(2) The excavation for trenched conduit under pavement shall be located at least 24 inches from the face of curb unless noted otherwise on the Plans. All underground conduit shall have a minimum depth of 30 inches below grade.

When multiple conduits in a common trench are required, no more than three (3) 4 inch or smaller conduits shall be laid on a single, horizontal level. Four (4) or more conduits shall be installed on two (2) levels as directed by the Engineer.

Conduits transitioning from trench to bridge abutments shall be securely attached to the retaining wall by means of galvanized clamps and clamp backs held in place by anchor bolts. Conduits shall be fastened as close to the underside of the abutment as possible, and securing clamps shall be installed every 5 feet. Conduits shall be continuous through party walls."

Method of Measurement. Conduit in trench will be measured according to Section 810 of the Standard Specifications.

Basis of Payment. This Work will be paid for at the contract unit price per foot for CONDUIT IN TRENCH, of the size specified, GALVANIZED STEEL. Excavation, including but not limited to trench and backfill, will not be included in this item and will be paid for separately.

(CTE – 10/28/2004)

MAST ARM, STEEL LIGHTING, 12 FT.

Description. This item consists of furnishing and installing a steel pipe, truss type mast arm of a specified length complete with pole plates and mounting hardware to support a roadway lighting luminaire as shown on the plans or as designated by the Engineer. Color shall be satin black.

Materials.

Mast Arm (12 ft.): BOE Material Specification 1450 and Standard Drawing 839.
Pole Plate: BOE Standard Drawing 659.

The pole plates shall be welded to a curved piece of A36 steel, which shall be able to accommodate two 5/8" steel bands; one top; one bottom. A hole shall be drilled in the steel to accommodate wire. The hole shall be smooth and free from burrs.

General Requirements. Perform work in accordance with Section 801 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Submittal Information. The Contractor shall provide complete product information to the Engineer and City personnel according to the above BOE specifications. The cost to obtain and submit this information is included in this item and separate payment will not be made.

Factory Inspection and Testing. The Contractor shall make provisions for factory inspection and testing of the mast arms by City personnel and City representatives according to BOE Specification 1450. Certified, independent paint inspection and testing shall also be performed as directed by the Engineer. The cost of these provisions shall be included in this item and separate payment will not be made. Inspection and testing shall be successfully completed prior to shipping the units.

Installation. The mast arm shall be installed with two bolts to the mast arm attachment. The pole shall have a one inch diameter hole drilled for cable at the location shown on the plans, or as directed by the Engineer. The mast arm attachment shall be banded to the pole at the height and location shown on the plans or as directed by the Engineer. The banding shall be 5/8" stainless steel. No mast arm will be installed until it is approved by the Engineer.

Mast arm shall not be installed without the appropriate luminaire. The luminaire is not included in this item and will be paid for under a separate pay item.

Method of Measurement. Each mast arm (complete with mounting hardware, mast arm attachments, appurtenances, and any required drilling or modification of the pole) that is furnished and installed as indicated will be counted as a unit for payment.

Basis of Payment. This work will be paid for at the contract unit price per each for a MAST ARM, STEEL LIGHTING, 12 FT., which will include all work as described herein.

(CTE – 11/04/2004)

CONCRETE FOUNDATION, STREET LIGHTING CONTROLLER

Description. This item consists of furnishing and installing concrete foundations at the locations shown on the plans or as directed by the Engineer. Work includes drilling of foundation shaft, furnishing and installing assemblies of steel reinforcing bars, anchor bolt assemblies and electrical conduit and bushings; swabbing and clearing the electrical conduits; and furnishing, placing and finishing concrete foundations.

General Requirements. Perform work in accordance with Section 836 of the Standard Specifications, Bureau of Electricity Standard, and City of Chicago Electrical Code, except as herein modified.

Materials. The concrete foundation shall meet the requirements of Bureau of Electricity (BOE) Drawing No. 880.

Conduit size and material shall be according to the plans.

Anchor bolt assemblies shall be in accordance with BOE Standard Drawing No. 811. Anchor bolts shall be fabricated from steel meeting the requirements of ASTMA400. Nuts shall be fabricated in accordance with ASTMA563. Washers shall be fabricated in accordance with ASTM F436. Anchor bolt diameter and length shall be as noted on the Plans. Anchor bolt assemblies shall include anchor bolts, nuts, and washers. All hardware shall be hot-dipped galvanized in accordance with ASTMA153.

Concrete shall be Class SI Concrete according to Section 1020 of the Standard Specifications.

Installation. Installation shall be in accordance with Article 836.03 of the Standard Specifications, except for paragraph (c), which is revised to read as follows:

"(c) Construction Requirements: The foundation shall be 20 inches in diameter, with a 15 inch bolt circle and four (4) identical anchor bolts. The top 15 inches of the foundation shall be square. Top of foundation shall be set at an elevation of 12 inches above grade unless noted otherwise on the Plans, and shall be finished smooth and level to allow proper mounting of an equipment enclosure. The foundation shall be centered back from the edge of pavement in accordance with dimensions as shown in the Plans. Depth of foundation shall be as shown on BOE Drawing No. 880. All concrete finishing work shall be accomplished by an experienced concrete finisher with approximately five (5) years experience and shall be approved by the Engineer prior to commencement of concreting operations. The cost of furnishing and installing all concrete and anchor bolts for the foundation shall be included in this Item."

Sawcutting. In locations where the foundation is installed in a paved area, the Contractor shall sawcut that portion of the pavement to be removed to facilitate installation of the equipment enclosure foundation. If the existing pavement is removed or damaged outside the required removal limits, the Contractor shall repair that portion at no additional expense to the satisfaction of the Engineer. The cost of sawcutting will be paid for under this Item.

Anchor Bolts. Anchor bolts shall be set in accordance with dimensions shown in the plans so that when an equipment enclosure is mounted on the foundation, the door shall be properly oriented as indicated in the plans. The anchor bolts shall be set by means of a metal template, which shall be submitted for approval before any foundation work is begun. The template shall hold the bolts plumb, and in proper position during the pour, and shall serve as a form for the top 6 inches of the foundation. Anchor bolts shall project 5 inches above top of foundation. The cost of furnishing and installing anchor bolt assemblies and template will be included in this Item.

Conduits. Foundation conduits shall be large radius, prefabricated elbows of a quantity, size and type as specified in the plans. The elbow ends above ground shall extend to an elevation even with the top of the anchor bolts, shall be centered within the foundation, and shall be fitted with approved conduit bushings prior to the installation of cables. The cost of furnishing and installing conduit stub-ups complete with bushings will be included in this Item.

Method of Measurement. Each equipment enclosure foundation furnished and installed complete according to the requirements of the specification will be counted as a unit for payment.

Basis of Payment. This Work will be paid for at the contract unit price per each CONCRETE FOUNDATION, STREET LIGHTING CONTROLLER.
(CTE – 10/28/2004)

ELECTRICAL MANHOLE 3'X4'X4' WITH 24" FRAME AND LID

Description. This item consists of furnishing the materials for and constructing a standard City of Chicago electrical manhole as specified herein, as shown on the plans and as directed by the Engineer.

General Requirements. Perform work in accordance with Section 801 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials.

General: Materials must be in accordance with Bureau of Electricity (BOE) Standard Drawing No. 730.

Frame and Cover. The manhole frame and cover must be fabricated from cast iron conforming to the requirements of BOE Standard Drawing No. 872.

Pulling Iron. The pulling iron must be fabricated in accordance with BOE Standard Drawing No. 7878.

Grate for Sump. The grate for sump must be fabricated in accordance with the requirements of BOE Standard Drawing No. 10792.

Installation. Installation must be in accordance with BOE Standard Drawing No. 730, and Standard Specifications Article 814.03 except for the following paragraph to be added to read:

"(e) French Drain. The french drain must be constructed in accordance with Article 601.06."

The manhole must be a cast-in-place concrete structure or precast reinforced concrete structure, complete with frame and cover, as approved by the Engineer. The number and orientation of conduit openings must be as shown on the plans.

The frame casting must be accurately set on a full collar of sewer brick and mortar to the finished elevation such that no subsequent adjustment is necessary. Mortar must be mixed in a proportion of one (1) part cement to three (3) parts sand by volume of dry materials.

Conduit openings in the manhole wall must be plugged with mortar after entering conduit laterals have been installed in place in the manhole. The mortar must seal the conduit openings effectively and as directed by the Engineer, and must be finished flush with the inner surfaces of the manhole wall. Mortar must be in accordance with Standard Specifications Article 1025.02.

Hooks and/or cable racks, for racking and training of cables, will not be included in this item and will be paid for under a separate pay item.

Ground rod(s) will be included in this item and will not be paid for separately.

Method of Measurement. Each electrical manhole (excavation, concrete, reinforcing rods, frame and cover, french drain, and appurtenant equipment) that is constructed and installed as indicated will be counted as a unit for payment.

Basis of Payment. This Work will be paid for at the contract unit price each for ELECTRICAL MANHOLE, 3' X 4' X 4' WITH 24" FRAME AND LID.

(CTE – 10/28/2004)

CABINET WORK, SPLICING, TESTING AND MISC.

Description. This item consists of furnishing, installing, and testing fiber optic cable splice and splice enclosures, optical connectors, single mode/multimode convertors, pigtailed and patch panels, hardware, and software as required for a fully operational communication system that provides all the features and functions identified herein and shown on the plans.

General Requirements. Perform work in accordance with Section 802 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code.

The interconnect communications system shall accommodate present and future data, voice and video transmission requirements for the City of Chicago. The communications layout is shown in the plans.

Materials.

Optical Splice/Splice Enclosure:

1. All permanent optical splices shall be of the fusion type.

A factory fabricated fusion splice kit containing materials necessary for quality fusion splicing shall be used for each fiber splice.

Splices made with the factory fabricated single mode fusion splice kit shall be capable of achieving not more than 0.1 dB loss at 1310 nm.

Splices made with the factory fabricated multimode fusion splice kit shall be capable of achieving not more than 0.1 dB loss at 850 nm.

An emergency restoration kit shall be provided to perform temporary splices. This kit shall include all necessary tools and materials to perform mechanical splices. Each mechanical splice kit shall be capable of achieving not more than 0.5 dB loss at any wavelength.

2. The outdoor optical splice enclosure shall be capable of aerial, duct, or buried applications.

The splice enclosure shall consist of an outer enclosure, an inner enclosure, and splice trays.

The splice enclosure shall be suitable for application in the temperature range of -40°C to $+70^{\circ}\text{C}$.

The splice enclosure shall provide space allowing entry of fiber optic cable without exceeding the minimum bend radius of the cable.

The splice enclosure shall be capable of through, branch, or mid-span type splice locations.

The splice enclosure shall be designed to permit selective fiber splicing (looping an interconnect cable in and out while only cutting into the desired fibers).

The splice enclosure shall allow splicing of all fibers up to the maximum number specified on the plans.

The outer enclosure shall be waterproof and re-enterable and shall utilize an encapsulant between the inner and outer enclosure to prevent the ingress of moisture.

The Contractor shall furnish and install splices and splice enclosures adjacent to the cabinets at the locations indicated on the plans and as specified herein.

Fiber Patch Panel:

Fiber Patch Panels (FPPs) shall be furnished and installed at the locations shown on the plans.

The optical patch panel shall terminate outside plant fiber pigtails. The FPP shall allow termination of a fiber patchcord to interconnect outside plant fibers to optical modems.

The approved type optical connectors on the end of each pigtail shall screw into a sleeve securely mounted to a patch panel within the controller cabinet. The maximum optical loss across the connection shall not exceed 0.25 dB.

The FPP shall be a surface mount panel as per BOE Drawing No. 909.

Optical Patch Cords And Pigtails:

Optical patch cords shall consist of a section of single fiber jacketed cable equipped with optical connectors at both ends. Patch cords for connections from FPPs to optical devices or other patch panels shall be equipped with factory installed connectors on both ends.

The optical pigtail shall consist of multiple fibers, factory connectorized on one end, suitable for installation in an outdoor duct run. Each fiber shall be individually jacketed, with aramid yarn fibers between the fiber and the subjacket. The fibers shall then be contained in a medium density polyethylene outer jacket. The multi-fiber pigtail shall be provided with eight (8) or twelve (12) multimode fibers or eight (8) single-mode fibers as required for the particular application. The hybrid fiber pigtail shall consist of eight (8) singlemode fibers and eight (8) multimode fibers.

The factory installed connectors furnished as part of optical patch cords and pigtails shall meet or exceed the requirements for approval of connectors specified herein.

The fiber portion of each patch cord and pigtail shall be a single, jacketed fiber with optical properties identical to the optical cable furnished under this Contract.

The cable shall be suitable for installation in outdoor manholes with water and/or ice.

Each jacketed fiber shall have a tensile strength in excess of 50 lbs.

Optical Connectors:

All permanent connector installations at traffic signal controller cabinets shall utilize factory installed and tested connectors on pigtails. Field installed connectors shall be allowed only at the indoor termination for connection to fiber optic modems.

The optical connectors furnished shall be uniform throughout this Contract. In the event that different types of connectors are necessary for the classification of modems supplied, a plan shall be submitted to the Engineer for approval for the use of one type of connector (for each fiber type) universally.

All single-mode connectors on equipment, patchcords, pigtails or panels shall be SC type or approved equivalent.

All multimode connectors on equipment, patchcords, pigtails or panels shall be ST compatible or approved equivalent.

The connectors shall meet, as a minimum, the following specifications:

Attenuation	≤0.4 dB
Tensile Strength	10 lbs. (Single fiber cable w/ strength member)
Durability	less than 0.3 dB change
Temperature Cycling	-40°C to +75°C, 40 cycles
Return Loss	Greater than 40 dB
Fiber Diameter	125 μm O.D., nominal

Installation.

The fiber optic cable shall be brought into each FPP as follows:

Fiber Optic Cable (Single Mode, Multi-Mode and Hybrid): The hybrid cable shall be brought into the manhole adjacent to each controller cabinet as shown on the plans, and fifty feet (50') of cable slack shall be coiled in the manhole.

The fibers of the hybrid cable shall be spliced in the manhole as shown on the plans. A factory connectorized, multi-strand, jacketed pigtail shall be fusion spliced to the active fibers in the cable for the respective cabinet. The remaining fibers in the cable shall not be cut and shall pass through the manhole. The pigtail shall be installed in conduit from the splice enclosure to the controller cabinet, unless otherwise noted, and shall be terminated on the fiber patch panel.

The fiber pigtail shall terminate in the controller cabinet within a fiber patch panel (FPP). The size of the FPP shall be sufficient to accommodate all fibers and connectors from the fiber pigtail. The location of the FPP shall not restrict access to other controller components. The fiber pigtail shall be firmly secured to the FPP using the manufacturer's recommended procedures or as directed by the Engineer.

Testing.

Testing of fiber optic cable shall be as follows:

1. **Manufacturer's Factory Tests.** The Contractor shall furnish data showing that each finished and installed fiber optic cable segment is traceable to the test data on file for each step in its manufacturing process.

The Engineer will make inspections and tests as are necessary to determine if the cable meets the requirements of this Special Provision. The Engineer will have the right to reject cable which is defective in any respect.

The Engineer will be given ten (10) working days, advance notice of the date the cable will be ready for final testing so that the Engineer may be present at the tests.

Physical tests shall be made on samples selected at random at the place of production. Each test sample shall be taken from the accessible end of different reels. Each reel selected and the corresponding sample shall be identified. The number and lengths of samples shall be specified for the individual test. All applicable tests for the cable materials and cable construction specified shall be performed.

Optical tests shall be made on the entire length of each continuous fiber provided within each fiber optic cable. Each test shall be completed during manufacture as required, and again prior to shipping, after the cable is secured to the reel in final shipping packaged form.

The manufacturer shall provide, at the point of production, apparatus and labor for making any or all of the following tests under the supervision of the Engineer, to include, but not be limited to:

Tensile Strength
Impact Resistance, Crushing, and Flexing
Optical Attenuation
Optical Spectral Dispersion
Optical Time Domain Reflectometry (OTDR)

2. Installed Field Tests. Testing of installed fiber optic cable shall be performed after complete installation and termination of the cables.

The Contractor shall notify the Engineer in writing five (5) working days in advance of the testing of the cable so that the Engineer, or his/her representative, may be present for the tests, if the Engineer so elects.

Optical testing shall be performed on all fibers within each cable, including those extra fibers which the Contractor elects to include above those invoiced, in order to meet the 100 percent fiber quality warranty.

Testing shall be performed on the fibers, as terminated on the FDPs or FPPs.

All necessary test equipment shall be provided by the Contractor to perform tests to include, but not be limited to, the following:

- a) Optical attenuation at 1310 and 1500 nm for single mode fibers and 850 nm and 1300 nm for the multimode fibers.
- b) Optical Time Domain Reflectometer (OTDR) records (labeled and identified), either photographic or computer printer/plotter output. Test shall be conducted for both directions of transmission. All OTDR tests shall be made with an OTDR approved by the Engineer.

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

Basis of Payment. This Work will be paid for at the contract unit price per each for CABINET WORK, SPLICING, TESTING, AND MISC.

(CTE – 10/25/2004)

MAINTENANCE OF EXISTING TRAFFIC SIGNAL INSTALLATION

Description. The Contractor shall maintain the existing traffic signal system at each intersection in this contract, as described in the Special Provision “Operation of Traffic Signals”, which is a section of this specification. The maintenance shall commence at a time after contract award that is mutually agreed upon by the Contractor, the City, and the State. Maintenance shall continue in force until the expiration of the time allotted for the project, or until new signals are accepted by the City, whichever comes first. If signal installation is not completed and accepted within the time allotted for the project, the signals shall be maintained by the Contractor at no additional cost to the City.

A properly operating traffic signal system shall be maintained by the Contractor at each intersection in the contract until such date as the new traffic signal system shall be accepted for operation and maintenance by the City. The acceptance conditions are noted in the Special Provision “Traffic Signal Turn On”, which is a section of this specification, and which date shall constitute the cut-off date for maintenance of signals at a specified intersection.

General Requirements. The Contractor shall follow the procedures as specified in Sections 800, 850, and 1086 of Standard Specifications, Bureau of Electricity standards and the City of Chicago Electrical Code, except as herein modified.

Maintenance Procedure. The Contractor shall perform the following maintenance program.

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

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

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

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

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

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

Method of Measurement. Maintenance of Existing Traffic Signal Installation will not be measured for payment.

Basis of Payment. This work will be paid for at the contract lump sum price for MAINTENANCE OF EXISTING TRAFFIC SIGNAL INSTALLATION, which shall be payment in full for the work described herein.

(CTE – 09/17/2004)

TEMPORARY TRAFFIC SIGNAL INSTALLATION

Description. This Work consists of furnishing, installing, maintaining, and removing temporary aerial wiring on existing poles or temporary wood poles to maintain continuous traffic signal operation while other intersection work is completed. This Work will also include any required temporary traffic signal equipment, materials, connections, temporary relocation and wiring of traffic signal heads or pedestrian signal heads to adjacent poles to maintain visibility and continuous traffic signal operation during construction.

Materials and Installation. The Contractor shall select an aerial wiring scheme based on the specific requirements of each intersection. The Contractor may use multi-conductor self-supporting cable or cable requiring messenger wire of sufficient voltage and rating to handle the intersection electrical requirements as approved by the Engineer and Bureau of Electricity. The

Contractor shall submit a sketch of the proposed wiring scheme (wire location, type of cable) to the Engineer and the Bureau of Electricity for approval prior to installation.

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

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

The Contractor shall maintain the existing traffic signal system at each intersection in this Contract, as described in the SPECIAL PROVISION OPERATION OF TRAFFIC SIGNALS, which is a section of these specifications. The maintenance shall commence at the time during construction, when the Contractor in the course of his Work begins construction at the intersection. Maintenance shall continue in force until the expiration of the time allotted for the project, or until the new signals are accepted by the sponsoring agency, whichever comes first. If signal installation is not completed and accepted within time allotted for the project, signals shall be maintained by the Contractor at no additional cost to the sponsoring agency. A properly operating traffic signal system shall be maintained by the Contractor at each intersection in the Contract until such date as the new traffic signal system will be accepted for operation and maintenance by the sponsoring agency at the direction of the Engineer. The acceptance conditions are noted in the SPECIAL PROVISION, TRAFFIC SIGNAL TURN ON, which is a section of these specifications, and which date shall constitute the cut-off date for maintenance of signals at a specified intersection.

General Requirements. Perform Work under this item in accordance with Sections 800, 801, 850 and 1086 of the Standard Specifications, Bureau of Electricity Standards and the City of Chicago Electrical Code, except as herein modified.

Maintenance Procedure. The Contractor shall perform the following maintenance program.

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

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

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

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

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

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

Special Provision Operation of Traffic Signals.

Existing traffic control signal installations and/or any electrical facilities at certain intersections included in this Section may be altered or reconstructed totally or partially as part of the Work on this Section. The Contractor is hereby advised that all traffic control equipment, presently installed at these locations, is the property of the City of Chicago.

The Contractor is further advised that the existing traffic signals, or the existing temporary installation, shall remain in operation during all construction stages except for the most essential down time. Any shutdown of the installation, for a period to exceed fifteen (15) minutes, shall have the prior approval of the Engineer. Such approval will generally only be granted during the period extending from 10:00 a.m. to 3:00 p.m. on weekdays. Any other traffic signal shutdown, either for periods in excess of one (1) hour or outside of the 10:00 a.m. to 3:00 p.m. weekday period shall have prior approval of the Engineer.

The Contractor, prior to the commencement of his Work, shall notify the City of Chicago of his intent to perform his Work. Upon request from the Contractor, the City of Chicago will locate any buried conduit or other electrical facility which may interfere with the Contractor's operations without charge to him. This will in no way relieve the Contractor's responsibility to repair and/or replace electrical facilities damaged by his operations.

Any known or suspected damage to the electrical facility shall be reported immediately to the Engineer. The Contractor will be held fully responsible for the repair and/or temporary, if, in sole opinion of the Engineer, such damage was caused by the negligence of the Contractor, his agents, or employees.

No part of this Special Provision shall be construed as exempting the Contractor from his duty to follow careful construction practices, including all standard provisions in the Standard Specifications for Road and Bridge Construction.

The intent of this Special Provision is to prescribe a procedure wherein a Contractor may obtain formal approval of a traffic signal installation at a given intersection, and a release from maintenance responsibility for the new materials installed, in order to be permitted to disconnect and remove the old traffic signal equipment.

When the road is open to traffic, except under conditions where existing traffic signals are being maintained or when a temporary traffic signal installation has been installed, the Contractor may request a turn-on and inspection of the completed traffic signal installation at each separate location. This request shall be made to the Bureau of Electricity, a minimum of three (3) working days prior to the time of the requested inspection. Upon demonstration that the signals are operating and all Work is completed in accordance with the Contract and to the satisfaction of the Engineer, the Bureau of Electricity's Inspector will then allow the signals to be placed into continuous operation. The Agency that is responsible for the maintenance of each traffic signal installation will assume the maintenance upon successful completion of this inspection.

Special Provision Traffic Signal, Turn On.

The intent of this Special Provision is to prescribe a procedure wherein a Contractor may obtain formal approval of a traffic signal installation at a given intersection, and a release from maintenance responsibility for the new materials installed, in order to be permitted to disconnect and remove the old traffic signal equipment.

When the road is open to traffic, except under conditions where existing traffic signals are being maintained or when a temporary traffic signal installation has been installed, the Contractor may request a turn-on and inspection of the completed traffic signal installation at each separate location. This request shall be made to the Bureau of Electricity, a minimum of three (3) working days prior to the time of the requested inspection. Upon demonstration that the signals are operating and all Work is completed in accordance with the Contract and to the satisfaction of the Engineer, the Bureau of Electricity's Inspector will then allow the signals to be placed into continuous operation. The Agency that is responsible for the maintenance of each traffic signal installation will assume the maintenance upon successful completion of this inspection.

Method of Measurement. Each temporary traffic signal installation that is installed and removed as indicated will be counted as a unit for payment. Weekly maintenance for temporary traffic signal installations will not be measured for payment. Each intersection installation will be measured for payment as one unit.

Basis of Payment. This Work will be paid for at the Contract Unit Price per each TEMPORARY TRAFFIC SIGNAL INSTALLATION, which will be payment in full for the material and work described herein. Each intersection installation will be paid for separately.

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

(CTE – 11/04/2004)

SERVICE INSTALLATION 200 AMP

Description. This item consists of furnishing and installing a service on a Commonwealth Edison Company wood pole for a 120/240 volt street lighting service installation per BOE Drawing Number 11925.

The 200 ampere installation can be used for either a 120 volt or 240 volt service.

Service Junction Cabinet. The cabinet shall be cast from corrosion resistant metal, subject to approval. Its dimensions shall not exceed 8 inches in width, 18 inches in height and 9 inches in depth, and it shall be weather proof. It shall contain a two (2) pole disconnecting device, such as Milbank Manufacturing Company 200 ampere size test block, Number 420, with bridge contacts and barrier strip, subject to approval. A suitable ground lug, subject to approval, to accommodate a 1/C No. 2/0 AWG stranded copper conductor shall be provided. The completed cabinet shall be as shown on City of Chicago Drawings Numbered 11922 and 11925.

Cable Grip. A 1-1/4 inch cable grip fitting shall be installed at top of cabinet to accommodate a 3/C No. 2/0 AWG service cable. Fitting shall be Pyle National Company Number DB-131, or an approved equal.

Service Riser. A 2-inch diameter galvanized rigid steel conduit riser terminated at the bottom with a galvanized rigid steel, large radius, conduit elbow shall be installed by the Contractor on the Commonwealth Edison Company service pole as shown on BOE Drawing Number 11925. The top of the riser shall terminate in the service junction cabinet and the end of the elbow shall connect to the horizontal conduit lateral leading to the control cabinet. Payment for the riser, elbow and attachments shall be included in the price bid for the complete Commonwealth Edison Company pole service junction unit.

Cable. A sufficient length of three (3) conductor service entrance cable shall 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 cables shall meet the requirements of Bureau of Electricity Specification No. 1457, or an approved equal, and shall be No. 2/0 AWG. The black and red conductors shall be connected to the disconnect device and the white conductor to the ground lug, for the 240 volt street lighting service installation.

Cables in Service Riser. Cables shall extend continuously from the load side of the disconnect device, down the riser and elbow, and in the conduit lateral to the load as indicated on the plans. Payment for cables in riser and elbow will be included in the bid price.

Basis of Payment. This Work will be paid for at the contract unit price per each for SERVICE INSTALLATION 200 AMP. Any charges by the utility company to provide electrical service to the service installation shall be paid for by the Contractor.

(CTE – 10/15/2004)

LUMINAIRE, STREET LIGHTING, HIGH PRESSURE SODIUM VAPOR

Description. This item consists of furnishing and installing a luminaire complete with lamp, internal ballast, fuses, and electrical components, mounting hardware, and appurtenances for installation as shown on the plans, as specified herein, and as directed by the Engineer.

General Requirements. Perform work in accordance with Sections 801 and 821 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials.

Luminaire (310 watt): BOE Material Specification 1368.
Lamps: Standard Specifications, Article 1067.02.
Fuse Holder and Fuses: Standard Specifications, Article 1065.01.
Pole Wire: Standard Specifications, Article 1066.09.

Luminaire shall be a 310 watt, multi-volt, "crime-fighter" drop lens unit with high power factor, Autoreg Ballast and a 240 volt connector. Ballast coil shall include all copper coils. The luminaire shall be furnished with no PE receptacle and a skin-over housing. The housing shall include a charcoal filter and rubber gasket, and an encapsulated starter aid. The luminaire shall be furnished with a Chicago "C" cast door; luminaire finish shall be black. The luminaire shall be complete with 310 watt high pressure sodium lamp, ballast, fuses, pole wire, and other ancillary materials.

Submittal Information. The Contractor shall provide complete product information to the Engineer and City personnel according to IDOT District 1 Specifications. The cost of this information shall be included in this item and separate payment will not be made.

Factory Inspection and Testing. The Contractor shall make provisions for factory inspection and testing of the luminaires by City personnel and City representatives according to IDOT District 1 Specifications. The cost of these provisions shall be included in this item and separate payment will not be made. Inspection and testing shall be successfully completed prior to shipping the units.

Installation. Installation shall be as described in Article 821.03 of the Standard Specifications.

Method of Measurement. Each luminaire (complete with lamp, internal ballast, fuses, pole wire, and electrical components, mounting hardware, and other appurtenances) that is furnished and installed as indicated will be counted as a unit for payment.

Basis of Payment. This Work will be paid for at the contract unit price each for LUMINAIRE, STREET LIGHTING, HIGH PRESSURE SODIUM VAPOR, of the type and wattage indicated.

(CTE – 10/29/2004)

CONVENTIONAL STREET LIGHTING UNIT, FOUNDATION MOUNTED

Description. This item consists of furnishing and installing a street light pole including mast arm, attachments and other appurtenances as required at the locations shown on the plans and as designated by the Engineer. The lighting unit shall be complete with all hardware and other ancillary material required for installation. Color shall be satin black.

General Requirements. Perform work in accordance with Section 801 and 830 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials.

Tapered Tubular Steel Pole (5" x 10" x 34'-6", 7 gauge): BOE Material Specification No. 1447 and Standard Drawing 808.

Mast Arm (12 ft.): BOE Material Specification 1450 and Standard Drawing 839.

Submittal Information. Provide complete product information to City personnel and City representatives according to the above BOE and Standard Specifications.

Traffic Signal Attachments. The Contractor shall make provisions for the attachment of traffic signals on the lighting units by Contractor personnel or City representatives according to the plans, and only if locations requiring such attachments are identified on the plans. These provisions will not be included in this item, but shall be coordinated with this item during submittal review, fabrication, and installation. Traffic signal devices and equipment will not be included in this item and will be paid for separately or by others in accordance with the Contract Documents.

Regulatory Signage Attachments. The Contractor shall make provisions for the attachment by others of regulatory signage on the lighting units, as shown on the plans or as directed by the Engineer. These provisions shall not be included in this item, but shall be coordinated with this item during submittal review, fabrication, and installation. Regulatory signs will not be included in this item and will be paid for separately or by others in accordance with the Contract Documents.

Inspection and Testing. The Contractor shall make provisions for factory inspection and testing of the lighting units by City personnel and City representatives according to the above BOE Specifications. Certified, independent paint inspection and testing shall also be performed as directed by the Engineer. The cost of these provisions shall be included in this item and separate payment will not be made. Inspection and testing shall be successfully completed prior to shipping the units.

Installation. Installation shall be in accordance with Articles 830.03, 830.03(a), and 830.03(b) of the Standard Specifications.

Method of Measurement. Each conventional pole lighting unit (pole, mast arm, mast arm attachments, and appurtenances) that is furnished and installed will be counted as a unit for payment.

Basis of Payment. This Work will be paid for at the contract unit price per each for CONVENTIONAL STREET LIGHTING UNIT, FOUNDATION MOUNTED.
(CTE – 10/29/2004)

TEMPORARY LIGHTING UNIT

Description. This item consists of furnishing, installing, and removing a temporary mast arm and luminaire complete with lamp, internal ballast, fuses, electrical components, and mounting hardware for mounting on a temporary traffic signal wood pole as shown on the Plans, as specified herein, and as directed by the Engineer.

General Requirements. Perform work in accordance with Section 801 of the Standard Specifications, the Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials.

Cable Splicing and Termination: Standard Specifications, Article 1066.06

Fuses: Standard Specifications, Article 1065.01(c)

Luminaire Wire: Standard Specifications, Article 1066.09

Lamps: Standard Specifications, Article 1067.02

Mast Arm: BOE Material Specification 1450

Luminaire: BOE Material Specification 1368

Installation. The Contractor shall furnish and install a temporary lighting mast arm, luminaire and all associated electrical equipment to ensure compliance with the applicable codes, standards, and Specifications.

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

The Contractor shall obtain electric power from existing lighting units or controllers as shown on the Plans.

Wiring shall include aerial cables and waterproof splices at each luminaire. Aerial cables will not be included in this Work, but will be paid for under a separate pay item.

The mast arm shall be installed with two bolts to the mast arm attachment. The mast arm attachment shall be banded to the pole at the height and location shown on the plans or as directed by the Engineer. The banding shall be 5/8" stainless steel.

Location of equipment for temporary lighting shall be adjusted and supported to accommodate field conditions encountered, including any potential interferences with other construction or equipment to be installed. The Contractor shall determine the exact location of each temporary lighting fixture prior to installation.

Temporary lighting equipment shall be installed to permit removal of parts requiring periodic replacement or maintenance without damage to other parts.

All equipment furnished shall be functional, new in appearance, and approved by the Engineer. The Contractor shall maintain all of the temporary lighting equipment furnished and installed under this item. No separate payment will be made for maintaining temporary lighting.

Removal. The Contractor shall disconnect and remove the temporary mast arm, luminaire, and all associated electrical equipment upon energizing and acceptance of the permanent lighting system. The mast arm and luminaire shall be removed from the site upon being removed from the temporary wood pole. Removal of aerial cables will not be included in this Work, but will be paid for under a separate pay item. The Contractor shall coordinate the removal of the temporary lighting with traffic signal work.

Method of Measurement. Each temporary lighting installation and removal complete with mast arm, luminaire, and associated hardware as specified herein will be counted as a unit for payment.

Basis of Payment. This Work will be paid for at the Contract Unit Price per each TEMPORARY LIGHTING UNIT, which will be payment in full for the material and work described herein.

Sixty percent of the bid unit price will be paid following acceptance of each installation. The remaining forty percent will be paid following the removal of each installation.

(CTE – 11/02/2004)

CONTROLLER, STREET LIGHTING

Description. This item consists of furnishing and installing an electrical control cabinet and associated equipment and making all connections on a foundation.

General Requirements. Perform work in accordance with Section 801 and 825 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials. The street lighting controller cabinet shall meet the requirements of Bureau of Electricity (BOE) Drawing No. 880.

The voltage specified shall be equated to the service capability of the Commonwealth Edison Company at the given location. The number of circuits to be serviced shall be that as shown on the plans.

The electro-mechanical devices within the cabinet shall be attached to a ½ inch thick phenolic, linen base, bakelite panel as per BOE Drawing No. 884, drilled to accommodate the various devices with allowable clearances, and secured in the cabinet with six 3/8 inch - 18 NC x 7/8 inch stainless steel machine screws.

The circuit breakers, single-pole, or two-pole shall meet the requirements of BOE Material Specification 1428. The mechanically held, remote control contactor, shall be Square-D Company, 8903 Series, Type PVB10 located per BOE Drawing No. 884, or equal as approved by the Engineer.

The cabinet finish shall be satin black to match the street light poles. Finishing procedure shall be powder coat painting in accordance with manufacturer recommendations, and as approved by the Engineer.

Submittals. Final design of the street lighting controller shall be reviewed and approved by the Engineer prior to beginning the manufacture and assembly of the equipment.

Installation. The controller shall be wired as shown on BOE Drawing No. 862. A 200 ampere, two pole main circuit breaker and three pole contactor shall be installed and the branch circuit breaker ampere ratings shall be as indicated on the plans.

For grounding the cabinet, a Thomas and Betts Company "LUGIT TERMINAL" accepting conductor size from #1/0 to #4/0 AWG, or equivalent, shall be attached inside the lower left hand side of the cabinet. It shall be installed with a 3/8 inch x 1 inch brass or stainless steel machine screw in a hole drilled and tapped for this purpose.

The cabinet shall be installed on a concrete foundation as shown on the plans. The foundation will not be included in this Work, but will be paid for under a separate pay item.

Feeder cables and branch circuit cables shall be installed in a neat 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.

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

Method of Measurement. Each lighting controller that is furnished and installed as directed will be counted as a unit for payment.

Basis of Payment. This Work will be paid for at the contract unit price each for a CONTROLLER, STREET LIGHTING of the type and amperage indicated.

(CTE – 10/28/2004)

PAINT EXISTING POLE, POST OR CONTROLLER COMPLETE

Description. This item consists of field painting existing steel and aluminum structures including poles and arms that support street lights and traffic control signals, controller cabinets for both street lights and traffic signals, traffic signal housings, and street light luminaire housings.

Material. All paints and painting materials intended for applications specified herein shall be certified by the Contractor to be of highest quality, shall be from the same manufacturer, and shall conform to the following, as applicable:

- a) Naptha. The solvent to be used for wiping down all metallic surfaces prior to application of paint shall be NAPHTHA conforming to ASTM Standard D838.
- b) Primer. This paint shall meet the requirements of Section 4 (composition) and Section 5 (properties) of the Steel Structures Painting Council's Paint Specification No. 25 for red iron oxide, zinc oxide, raw linseed oil and alkyd primer as outlined in Volume 2, Systems and Specifications, Third Edition.
- c) Intermediate Coat. The paint shall meet the same requirements as the primer except that it shall contain a contrasting shade of iron oxide/ or be tinted or shaded to produce a distinct contrast of at least 10 Hunter Delta E units compared to the primer.

- d) Finish Coat. This paint shall meet the requirements of Section 4 (composition) and Section 5 (properties) of the steel Structures Painting Council's Paint Specification No. 21 for lead free white or colored silicone alkyd paint, Type 1, high gloss as outlined in Volume 2, Systems and Specifications, Third Edition.
- e) Color. A paint sample shall be submitted for approval prior to authorization to paint. The color shall be black as specified on the plans. The sample shall be in the form of a 4" by 8" color chip. The Contractor shall provide a field-painted sample, if requested by the Engineer. The field sample shall be of the same type of equipment to be painted and shall be chosen by the Engineer.
- f) Product Data. The Contractor shall submit the manufacturer's technical information, label analysis, and application instructions for each material proposed for use. Each material shall be listed and cross-referenced for the specific coating, finish system, and application. Each material shall include the manufacturer's catalog number.

Delivery, Storage, and Handling.

- a) The materials shall arrive at the job site in the manufacturer's original, unopened packages and containers bearing the manufacturer's name label, product name, product description, manufacturer's stock number, date of manufacture, contents by volume for pigment and vehicle constituents, thinning instructions, application instructions, and color name and number.
- b) Materials to be stored should be kept in tightly covered containers in a well ventilated area at a minimum ambient temperature of 45 degrees Fahrenheit.

Preparation of Surfaces.

- a) Steel Surfaces. Remove loose or scaling paint, dirt, oil grease, rust and foreign matter, as necessary, to receive paint. Wire brushing, where specified herein, shall be done with an approved power tool operated from a portable power source. After wire brushing, the complete surface shall be thoroughly wiped with a rag containing NAPTHA.
- b) Aluminum Surfaces. Remove loose scale and paint, dirt, oil, grease and foreign matter, as necessary, to receive paint. Wire brush surfaces, where necessary, to remove loose scale. Wire brushing, where specified herein, shall be done with an approved power tool operated from a portable power source. After wire brushing, the complete surface shall be thoroughly wiped with a rag containing NAPTHA.
- c) Weather Conditions. Do not apply paint coatings when temperature is below 40 degrees F., or during periods of rain, fog, snow, or when relative humidity is above 85%.
- d) Application Conditions. Surfaces to be painted shall be clean, dry, and relatively smooth. Each paint coating shall be applied smoothly and worked out evenly. Paint shall be thoroughly mixed just prior to application. Thinning shall be held to a minimum, and shall be done only when required for proper application. Thinners to be used shall be the manufacturer's recommended thinner for the paints used; mixed thoroughly to assure complete blending with the coating. Spray painting will not be permitted when wind conditions are greater than 15mph. Painting shall be done as soon after cleaning as possible.

Detail Painting Requirements.

- a) Street Light Poles. Street light poles to be painted under these specifications are steel structures which will vary from twenty-seven (27) to thirty (30) feet in height, with average surface required to be painted of approximately forty-eight (48) square feet. Some rusting and/or bare spots will be encountered which Contractor will be required to wirebrush. The pole shall be thoroughly wiped with NAPTHA, and the finish coating of black applied, as stated on the plans.
- b) Mast Arm Brackets and Electrical Luminaries. Mast arms which are attached to the street light poles will consist of 2-inch steel pipe sections which will vary between eight feet (8') and fifteen feet (15') in length. Mast arms in twelve foot (12') and 15 foot (15') sizes will have a supporting strut of two inch (2") steel pipe. Surface scale and rust will be wirebrushed, and these mast arms thoroughly wiped with NAPTHA, and finish painted with black as stated on the plans.
- c) Traffic Signal Post. Aluminum and steel posts consist of five inch (5") pipe sections atop a conical base or base flange sixteen inches (16") in diameter, and will vary in height from three feet six inches (3' - 6") to twenty feet (20'). Spot scaling shall be wirebrushed and the posts thoroughly wiped with NAPTHA, and finish painted with black as stated on the plans.
- d) Street Light Controllers. The control cabinets will be cast aluminum and are approximately 18" x 14" x 30" in size. They will be mounted atop a three foot six inch (3' 6") high post. The Contractor shall wirebrush, as necessary, and thoroughly wipe the complete cabinet and casting with NAPTHA, and apply finish coating of black to all surfaces as stated on the plans.

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

Basis of Payment. This Work will be paid for at the contract unit price each for PAINT EXISTING POLE, POST OR CONTROLLER COMPLETE.

(CTE – 10/28/2004)

REMOVE EXISTING LIGHTING CONTROLLER AND SALVAGE

Description. This item consists of disconnecting, removing, dismantling, and transporting to a City storage facility an existing street lighting controller unit and all associated mounting hardware and appurtenances, removing and disposing of its foundation, and backfilling the excavated areas. Work shall be performed as specified herein, as shown on the plans and as directed by the Engineer.

General Requirements. Perform work in accordance with Section 801 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Removal of Street Lighting Controller Unit, Owner Salvage. The street lighting controller unit and all associated hardware and appurtenances will remain the property of the City of Chicago. The line side cable shall be removed back to the utility source, as directed by the Bureau of Electricity (BOE) field representative. Branch circuit cables shall be removed or reconnected as directed by the Bureau of Electricity (BOE) field representative. Removed cable will become the property of the Contractor, and shall be disposed of outside the right of way by the Contractor. Cable removal or reconnection, including any required temporary splices, will not be paid for separately but shall be included in this item at no additional expense.

The Contractor shall deliver the removed street lighting controller units to a City of Chicago Yard in Chicago, Illinois. City stock material returns will require a minimum of 48 hours prior notice to the BOE Representative (312) 746-4636. The Contractor shall complete and fax (312) 746-4626 an advance copy of the State's form(s) GF-2 to the BOE Representative for review. The Representative will review the completed form(s) and advise on a schedule of material delivery.

The Contractor shall provide three (3) final copies of the State's form(s) GF-2, listing the quantities and type of equipment that is to remain the property of the City, to the BOE Representative upon delivery. The completed forms shall include equipment model and serial numbers where applicable. The Contractor shall also provide a copy of the Contract plans or special provisions showing the quantities and type of equipment. The Contractor will be responsible for the condition of the lighting controller from the time of removal until the acceptance of a receipt drawn by the City indicating that the items have been returned in good condition.

Foundation Removal. Foundation removal shall be in accordance with Section 845.05 of the Standard Specifications.

Method of Measurement. Each street lighting controller unit that is removed and salvaged, including the foundation that is removed and disposed of, as indicated, will be counted as a unit for payment.

Basis of Payment. This Work will be paid for at the contract unit price each for REMOVE EXISTING LIGHTING CONTROLLER AND SALVAGE.

(CTE – 10/28/2004)

REMOVE EXISTING LIGHTING UNIT AND SALVAGE

Description. This item consists of disconnecting, removing, dismantling, and transporting to a City or local storage facility, an existing street lighting unit as specified herein, as shown on the plans and as directed by the Engineer.

General Requirements. Perform work in accordance with Section 801 and 842 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Removal. Street lighting pole (anchor base or embedded), ballast housing base, mast arms, bracket arms, pole mounted luminaires, and all associated hardware and appurtenances will remain the property of the City of Chicago. Embedded poles shall be removed by means other than burning where possible. Street lighting cable shall be removed or reconnected as required back to the last unaffected source as directed by the Bureau of Electricity (BOE) field representative. Removed cable will become the property of the Contractor, and shall be disposed of outside the right of way by the Contractor. Cable removal, or reconnection, including any required temporary splices, will not be paid for separately but will be included in this item at no additional expense.

Delivery to City. The Contractor shall deliver the removed street lighting units to a City of Chicago Yard in Chicago, Illinois. City stock material returns will require a minimum of 48 hours prior notice to the BOE Representative (312) 746-4636. The Contractor shall complete and fax (312) 746-4626 an advance copy of the State's form(s) GF-2 to the BOE Representative for review. The BOE Representative will review the completed form(s) and advise on a schedule of material delivery.

The Contractor shall provide three (3) final copies of the State's form(s) GF-2, listing the quantities and type of equipment that is to remain the property of the City, to the BOE Representative upon delivery. The completed forms shall include equipment model and serial numbers where applicable. The Contractor shall also provide a copy of the Contract plans or special provisions showing the quantities and type of equipment. The Contractor shall be responsible for the condition of the street lighting equipment from the time of removal until the acceptance of a receipt drawn by the City indicating that the items have been returned in good condition.

Method of Measurement. Each lighting unit (ballast housing or pedestal base, pole, mast arms, bracket arms, luminaires, and appurtenant equipment) that is removed and salvaged as indicated will be counted as a unit for payment.

Foundations and embedment removal is not included in this item.

Basis of Payment. This Work will be paid for at the contract unit price per each for REMOVE EXISTING LIGHTING UNIT AND SALVAGE.

(CTE – 10/15/2004)

CONTROLLER, TRAFFIC, 16 LOAD BAY, P CABINET

Description. This item consists of furnishing and installing a traffic signal controller and associated equipment in a cabinet onto a foundation and making all necessary connections.

General Requirements. Perform work in accordance with Sections 802 and 857 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Material. The material must meet the requirements of BOE Material Specification 1469. The cabinet shall be a P cabinet 55 inches high by 44 inches wide by 26 inches deep with 16 load bays. Each load bay shall include a load switch. No communications interface equipment shall be included.

Installation Requirements. The controller shall be enclosed in a housing and installed in a completely wired cabinet. The model and serial numbers of the controller shall be affixed on the front of the controller housing and be readily visible. The cabinet shall be set onto a pad foundation designed specifically for the cabinet, and affixed with four bolts provided with the foundation.

The controller shall be programmed to provide the sequencing and timing of operation as shown on the plans. Electric cables inside the cabinet shall be neatly trained along the base and back of the cabinet. Each conductor used shall be connected individually to the proper terminal, and the spare conductors shall be insulated and bound into a neat bundle. Each cable shall 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 shall be wired to a separate circuit whether or not the signal plans call for a split movement. Maximum load per signal circuit shall be set not to exceed 700 watts. Final offset timing of the time base coordinator will be set in the field by City personnel.

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

Color. Color of the exterior surfaces of the cabinet must be black unless otherwise noted on the plans and directed by the Engineer. Color must conform to City of Chicago Standard Specifications. A color sample must be submitted to the Engineer for approval prior to fabrication.

Method of Measurement. Each Controller will be measured on a per each basis as installed and accepted by the Engineer and the Bureau of Electricity.

Basis of Payment. This Work will be paid for at the contract unit price each for CONTROLLER, TRAFFIC, 16 LOAD BAY, P CABINET.

(CTE – 10/28/2004)

STAR MODEM

Description. This item consists of furnishing and installing an external star modem and associated communications connections in controller cabinets as shown on the plans or directed by the Engineer.

Materials. The external star modem shall be fully compatible with the internal fiber optic modems in the system master and local controllers, and shall be located within the controller cabinet. The star modem shall be capable of splitting multimode signals into three or more directions while maintaining the multi-drop, polling operation of the closed loop system.

Installation Requirements. Additional electric and fiber optic cables inside the cabinet shall be neatly trained along the base and back of the cabinet. Each conductor used shall be connected individually to the proper terminal and the spare conductors shall be insulated and bound into a neat bundle. Each cable shall be marked with suitable identification.

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

Basis of Payment. This Work will be paid for at the contract unit price each for STAR MODEM. The price will also include all fiber jumper cables, wiring and connections to the star modem.

(CTE – 10/28/2004)

TRANSCEIVER, FIBER OPTIC

Description. This item consists of furnishing and installing a fiber optic transceiver that is fully compatible with the LMD-40 pretimed controllers specified elsewhere in these Special Provisions.

General Requirements. Perform work under this item in accordance with Section 864 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Code, except as herein modified.

Fiber Optic Communications Module. The fiber optic communications module shall be a Peek LMC-4 Internal Multi-Mode Fiber Optic Modem or approved equal identical to those supplied with the pretimed controllers. The module shall be internal to the LMD-40 series controller. It shall communicate at up 4800 baud at a wavelength of 850 nm. The module shall utilize industry standard ST compatible connectors for the primary (receive) and secondary (transmit) ports to provide full-duplex operation.

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

Basis of Payment. This Work will be paid for at the contract unit price each for TRANSCEIVER, FIBER OPTIC. Such price will include the cost of furnishing the unit complete with all documentation, hardware and accessories necessary for proper operation.
(CTE – 10/15/2004)

ELECTRIC CABLE IN CONDUIT NO. 12, 19/C

Description. This item consists of furnishing and installing electric cable in conduit for traffic signals of the type, size and number of conductors as specified on the plans.

General Requirements. Perform work in accordance with Sections 802, 817, and 873 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials. All cable shall conform to the requirements of BOE Material Specification 1474, for Traffic Signal Cable.

Installation Requirements. All cable shall be installed in conduit, as indicated on the plans, with care to prevent damage to the insulation or cable. Suitable devices shall be used in pulling the cable, and only approved lubricants shall be used. All cables installed in conduit will be from the power source to the traffic signal controller, from the traffic controller to the City traffic signal junction box, or from junction box to junction box. Cables that terminate in a traffic signal controller or traffic signal junction box shall extend two inches (2") above the bottom of the box, or cabinet, and the following procedure shall be followed:

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.

Traffic Signal Junction Box.

- (1) Remove twenty four inches (24") 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 side and back of the box.
- (5) Connect all conductors to terminal strip.

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

<u>Location</u>	<u>Length of Slack Cable (feet)</u>
Base of Controller Post	1
Detector, Junction Box	1
Base of Traffic Signal Post or Traffic Signal Pole	2
City Handhole	6
City Manhole	12
Commonwealth Edison Manhole	25

Cable slack in manholes/handholes shall be trained and racked in the holes. If racks are non-existent, racks shall be provided, which will be a part of a separate pay item.

No cable splices shall be allowed for traffic signal cable.

Method of Measurement. This Work will be measured horizontally between changes in direction, plus slack cable of the length shown above. Vertical cable will not be measured for payment.

Basis of Payment. This Work will be paid for at the contract unit price per lineal foot for ELECTRIC CABLE IN CONDUIT NO. 12, 19/C.

(CTE – 10/25/2004)

FIBER OPTIC HYBRID CABLE IN CONDUIT 6SM/6MM

Description. This item consists of furnishing and installing fiber optic cable in an innerduct within a conduit, as shown on the plans or as directed by the Engineer.

Material. The cable shall meet the requirements of BOE Material Specification 1482.

Overview. The Dan Ryan Phase II Frontage Road (Wentworth/Wells) traffic signal interconnect system shall consist of one closed loop system. The following is a list of intersections included in the closed loop system.

Closed Loop System

1. Wentworth and 47th.
2. Wells and 47th.
3. Wentworth and 51st.
4. Wells and 51st.
5. Wentworth and 55th.
6. Wells and 55th.
7. Wentworth and 57th.
8. Wells and 57th.
9. Wentworth and 59th.
10. Wells and 59th.
11. Wentworth and 63rd.
12. Wells and 63rd.

63rd Street bridge intersections with Wentworth Avenue and Wells Street will be interconnected as part of this Contract. 47th, 51st, 55th, 57th, and 59th Street bridge intersections with Wentworth Avenue and Wells Street will have their own individual interconnect contracts.

As part of a separate contract, the above listed intersection will be ultimately interconnected to a master controller at northeast corner of eastbound Garfield and Wentworth forming a single closed loop system.

The controllers at above intersections shall use an RS-232 interface to transfer data from the controller to a fiber optic modem. The optical modems shall operate in a drop-and-insert configuration, where each modem receives (drop) or transmits (insert) information relative to that local site. In addition, the modem shall regenerate signals from down stream modems with no loss of data or degradation of performance. This is also known as a daisy-chained configuration.

General Requirements.

Hybrid Fiber Optic Cable. The cable shall meet, as a minimum, the following specifications and conform with the latest issue of Bellcore TR-TSY-00020: Generic Requirement for Optical Fiber and Optical Fiber Cables. ANSI/EIA-472: Generic Specification of Fiber Optic Cables, and REA-PE-90; and appropriate Sectional Specifications thereof.

Cable Construction.

Cable construction, other than as specified, shall be approved by the Engineer.

1. The cable shall be constructed entirely from dielectric material.
2. A cable suitable for either direct installation into a duct bank or conduit shall be supplied.
3. The cable shall be of gel-filled, loose tube construction with up to 12 buffer tubes wrapped around a dielectric central strength member. All fiber(s) shall be contained within buffer tubes, and each buffer tube shall have an inside diameter much greater than the total diameter(s) of the fiber(s) it supports.

4. Each fiber or group of fibers shall be free-floating within the tubes such that all mechanically or environmentally induced stress placed upon the cable is de-coupled from the fibers. The air within the buffer tubes shall be displaced with a gel to prevent entry by water and to facilitate free movement of the fiber(s) within.
5. The buffer tubes shall be color coded in compliance with EIA/TIA-598: Color Coding of Fiber Optic Cables.
6. Cables constructed of less than six fibers shall have a buffer tube provided for each fiber: cables constructed of more than six fibers may have several fibers occupy a buffer tube, with equal distribution of fibers as far as practicable. All fibers shall be color coded in compliance with EIA/TIA-598: Color Coding of Fiber Optic Cables. Single-mode and multimode fibers shall not occupy the same buffer tube.
7. In buffer tubes containing multiple fibers, the colors shall be stable during temperature cycling and not subject to fading or smearing onto each other or into the gel filling material. Colors shall not cause fibers to stick together.
8. The cable shall have an interstitial filing between the buffer tubes and throughout the remainder of the cable to prevent entry of water.
9. A binder wrapping strength member of aramid fibers shall be provided as a final layer prior to application of the outer jacket.
10. The cable shall be provided in continuous lengths. Each fiber shall be pulled from the same optical waveguide form and shall be free of splices. Each optical fiber shall consist of a doped silica core surrounded by a concentric silical cladding: the use of any other material shall be approved by the Engineer.
11. A permanent marking shall be employed on the outer jacket of the cable which shall show the date of manufacture and the manufacturer's name. A numerical sequence shall be marked on the outer jacket, at intervals no greater than ten (10) feet, to facilitate determination of length of cable and amount of cable remaining on the reel. The height of the marking shall be 2.5 mm nominal.
12. All optical fibers shall be proof tested by the fiber manufacturer at a minimum load of 100 kpsi.
13. All optical fibers shall be 100% attenuation tested at the factory for compliance with performance specifications described herein. The attenuation of each fiber shall be provided with each cable reel.
14. The outer jacket shall be constructed of medium density polyethylene, minimum jacket thickness of 1.4 mm. Jacketing material shall be applied directly over the tensile strength members and flooding compound. The outer jacket shall be UV and fungus resistant.

Singlemode Optical Specifications.

1. Optical Specifications:	
Operation Wavelength	1,300 nm and 1,550 nm
Optical Attenuation	@ 1,300 nm: 0.7 dBI/km @ 20C @ 1,550 nm: 0.6 dB/km @ 20C
Optical Dispersion	@ 1,300 nm: 3.5-4.5 psec/nm-km @ 1,550 nm: (</=) 20 psec/nm-km
Zero Dispersion Wavelength	1,300 to 1,320 nm. Nominal
Zero Dispersion Slope	<=0.092 ps/nm ² -km
Fiber Core Diameter	8.3 um. Typical
Fiber Coating Diameter	250+/-10 um
Fiber Cladding Diameter	125+/-2 um
Core to Cladding Offset	<=0.8 um
Cladding Non-Circularity	<=1.0%
Spot Size	9.3+/-0.5 um @ 1300 nm 10.5+/-1 um @ 1550 nm
Cutoff Wavelength	<=1250 nm

Multimodal Optical Specifications.

1. Optical Specification:	
Operation Wavelength	850 nm and 1.300 nm
Optical Attenuation	@ 850 nm: 400 MHZ-km @ 20C @ 1,300 nm: 400 MHZ-km @ 20C
Fiber Core Diameter	62.5 um +/-3.0 um
Fiber Coating Diameter	250 +/-15 um
Fiber Cladding Diameter	125 +/-2.0 um
Core to Cladding Offset	<=3.0 um
Cladding Non-Circularity	<=2.0%
Core Non-Circularity	<=6.0%
Numerical Aperture	0.275+-0.015
Index	Graded Index

Hybrid Cable Mechanical Specifications.

Crush Resistance	5,000 n/m. Length of cable
Cable Outside Diameter	0.50" nominal
Minimum Bending Radius:	
Installation	20 times the cable diameter
Static	10 times the cable diameter
Temperature:	
Installation	-30C to +70C
Storage/Operation	-40C to +70C
Humidity	0 to 100%
Tensile Strength:	
Installation	2,700 N (600 ibf)
Static	600 N (135 ibf)

Installation. Cable shall be pulled through the conduit or innerduct as shown on the plans, or as directed by the Engineer. The manufacturer's instructions shall be carefully followed so as not to damage the cable. After the cable is pulled, traces shall be obtained from the installed cable using an OTDR (Optical Time Division Reflectometer) to insure that the cable is good. A bad trace will require that new cable be installed.

Method of Measurement. The cable will be measured per foot installed, and will include slack. Splicing and terminating fiber optic cable will be covered by different items.

Basis of Payment. This Work will be paid for at the contract unit price per foot for FIBER OPTIC HYBRID CABLE IN CONDUIT 6SM/6MM.
(CTE – 10/28/2004)

TRACER CABLE

Description. This item consists of providing a trace cable (copper #10) with fiber optic cable in conduit for the purpose of locating a utility.

General Requirements. This Work shall be in accordance with Section 871 Standard Specifications and the City of Chicago Bureau of Electricity, except as herein modified.

Method of Measurement. The length of measurement will be the distance horizontally measured between changes in direction.

Basis of Payment. This Work will be paid for at the contract unit price per lineal foot for TRACER CABLE.
(CTE – 10/28/2004)

ELECTRIC CABLE IN CONDUIT, COAXIAL VIDEO, RG-59/U

Description. This item consists of furnishing and installing electric cable of the size, type and number of conductors specified on the plans.

General Requirements. Perform work in accordance with Sections 801, 802, and 873 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified. The cable shall comply with the following requirements.

Materials. Coaxial cable shall be 75 ohm and shall not have an attenuation greater than 10 dB/100 feet at 900 MHz. As part of this Contract, coaxial cable will run from an additional junction box provided on a combination pole to the manhole near the controller as shown on the plans. The cable shall be coiled and racked with slack for future connection to the controller by Contract 9B8 (62802).

Installation. All cable shall be installed in conduit, aerially or in poles, as indicated on the plans, with care to prevent damage to the insulation or cable. Suitable devices shall be used in pulling the cable and only approved lubricants shall be used. All cables installed in conduit shall be from the power source to the traffic signal controller, from the traffic controller to the City traffic signal junction box, from junction box to junction box, or as shown on the plans. Signal and service cables that terminate in a traffic signal junction box shall extend 2 feet above the bottom of the box or cabinet and the following procedure shall be followed:

a. Controllers

- (1) Remove 36 inches of neoprene jacket.
- (2) Wrap vinyl electrical tape on 2 inches of the neoprene jacket and on 2 inches of the insulated conductors.
- (3) Remove one (1) inch 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 24 inches of neoprene jacket.
- (2) Wrap vinyl electrical tape on 2 inches of neoprene jacket and on 2 inches of the insulated conductors.
- (3) Remove 1 inch of insulation and scrape copper conductor.
- (4) Train cables neatly along the side and back of the box.
- (5) Connect all conductors to terminal strip.

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

<u>Location</u>	<u>Length of Slack Cable</u>
Base of Controller Post	1 foot
Detector, Junction Box	1 foot
Base of Traffic Signal Post or Traffic Signal Pole	2 feet
Controller Cabinet	3 feet
City Handhole	6 feet
City Manhole	12 feet
Commonwealth Edison Manhole	25 feet

Cable Splices. Cable splices shall be made only for magnetic detector leads, detector loops, and existing copper interconnect cable or at locations shown on the plans. Make splices in accordance with Article 873.03 of the Standard Specifications.

Method of Measurement. The length of measurement shall be the distance horizontally measured between changes in direction including slack cable. All vertical cables will not be measured for payment. Lengths of slack cable required will be paid for at the Contract Unit Price per lineal foot for cable of the type specified.

Basis of Payment. This Work will be paid for at the contract unit price per lineal foot for ELECTRIC CABLE IN CONDUIT, COAXIAL VIDEO, RG-59/U.

(CTE – 10/26/2004)

MAST ARM, STEEL

Description. This item consists of furnishing and installing a steel, monotube, mast arm for the purpose of supporting traffic signals, and/or illuminated or painted signs on an anchor base pole at the locations shown on the plans, or as specified or directed by the Engineer. The length of the mast arm and the angular orientation of the arm relative to the centerline of the roadway shall be as indicated on the plans.

A mast arm shall be installed only on a 3 gauge pole, and the length of the mast arm shall govern the minimum base diameter of the pole on which the arm is to be installed, in accordance with the following chart:

MAST ARM	POLE BASE
LENGTH (feet)	DIAMETER (inches)
35	12.5

General Requirements. Perform work under these items in accordance with Sections 800 and 1086 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials. The mast arm shall be 7 gauge steel meeting the requirements of BOE Standard Drawing 870 and the applicable sections of BOE Material Specification 1447.

Installation. The mast arm shall be mounted on the pole at the height specified on BOE 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 shall be field drilled in the pole in line with the orientation of the mast arm. The hole shall 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 shall be inserted into the finished hole prior to the installation of the cable.

Two holes shall 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 shall be drilled after the mast arm is in place in order that the position of the holes shall match the location of the locator bushings attached to the back half of the clamp.

All signals, signs, and electrical equipment shall 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 shall be coordinated with the attachment of the mast arm to the pole. The clamp bolts shall 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 shall be secured in place with the attachment screws provided.

Painting. The mast arm shall be delivered completely finished with a factory applied powder coat per BOE Material Specification 1447. The Contractor shall utilize non-abrasive slinging materials and shall otherwise exercise due care in erecting the pole and mast arm to prevent any damage to the finish.

Color. Color shall be black conforming to City of Chicago Standard Specifications. A color sample shall be submitted to the Engineer for approval prior to fabrication.

Method of Measurement. This Work will be measured per each basis.

Basis of Payment. This Work will be paid for at the contract unit price for each MAST ARM, STEEL, of the type and length indicated.

(CTE – 10/26/2004)

POLE STEEL, ANCHOR BASE

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

General Requirements. Perform work under this item in accordance with Sections 800, 877, and 830 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials. The pole shall meet the requirements of BOE Material Specification 1447.

Installation Requirements. The pole shall 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 shall be used as shown on BOE Drawing No. 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 shall be cut off to provide the necessary clearance. The excess shall not be burned off. The pole shall be set secure, properly orientated, and plumb using the nuts and washer provided with the anchor bolts. The bolt covers, handhole cover, and pole cap shall be securely attached.

Painting. The pole shall be delivered completely finished with a factory applied powder coat paint system. The Contractor shall utilize non-abrasive slinging materials and shall exercise due care in erecting the pole and mast arm to minimize any possible damage to the finish. When necessary, the Contractor shall use factory approved touch-up materials and methods to restore the finish to like new appearance and durability.

Color. Color shall be black conforming to City of Chicago Standard Specifications. A color sample shall be submitted to the Engineer for approval prior to fabrication.

Method of Measurement. This item will be measured per each unit installed, complete with anchor bolt covers, pole cap, and handhole cover.

Basis of Payment. This Work will be paid for at the contract unit price each for POLE, STEEL, ANCHOR BASE, of the type, length, diameter and gauge indicated, which will be payment in full for the material and work described herein. Light standard foundations, mast arms, and luminaires will not be included in this pay item but will be paid for separately.
(CTE – 10/25/2004)

CONCRETE FOUNDATION

Description. This item consists of furnishing and installing concrete foundations at the locations shown on the plans or as directed by the Engineer. Work includes drilling of foundation shaft, furnishing and installing assemblies of steel reinforcing bars, anchor bolt assemblies and electrical conduit and bushings; swabbing and clearing the electrical conduits; and furnishing, placing and finishing concrete foundations.

General Requirements. Perform work in accordance with Sections 836 and 878 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials. Anchor bolts shall conform to BOE Material Specification 1467.

Construction. Twenty-four inch diameter foundations shall conform to BOE Drawing No. 818. Thirty inch diameter foundations with 16.5 inch bolt circles shall conform to BOE Drawing Number 817.

The top surface of these foundations shall be set at an elevation of two inches (2") above grade or as directed by the Engineer. Care shall be taken to install a level foundation and to provide adequate anchor rod projections for double-nut installation. The foundations shall be centered back from the face of the curb as shown on the plans.

Foundation raceways shall consist of large radius conduit elbow(s) in quantity, size and type shown on the plans. The elbow ends above ground shall be capped with standard conduit bushings. The foundation top shall be chamfered 3/4 of an inch.

Anchor bolts shall be set so that when poles are mounted on the foundations, the street lighting mast arm shall be properly oriented as indicated on the plans. The anchor bolts shall be set by means of a metal template which shall be submitted for approval before any foundation work is begun. The template shall hold the bolts vertical, and in proper position, and shall serve as a form for the top six (6) inches of the periphery of the foundation.

Ground Rods.

1. Ground rods for roadway lighting foundations shall be 3/4" x 10' in size which will be paid as a separate item.
2. Ground rods for traffic signal foundations shall meet BOE Material Specification 1465, which will be paid as part of foundation.

Method of Measurement. This item will be measured for payment in feet of the foundation in place. Extra foundation depth, beyond the directive of the Engineer, will not be measured for payment.

Basis of Payment. This Work will be paid for at the contract unit price per foot of CONCRETE FOUNDATION, of the type, diameter, and anchor rods size indicated.
(CTE – 11/04/2004)

CONCRETE FOUNDATION FOR TYPE "P" BASE MOUNTED TRAFFIC SIGNAL CONTROLLER

Description. This item consists of furnishing and installing a Concrete Foundation for a Base Mounted Traffic Signal Controller as shown on Bureau of Electricity Drawing No. 888.

General Requirements. Perform work in accordance with Section 878 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

The foundation shall have a minimum depth of forty inches (40") below grade. The foundations shall be centered back from the face of the curb as shown on the plans. The foundation top shall be chamfered 3/4 of an inch.

The Contractor shall furnish anchor bolts, hardware, conduit elbows, and all other material shown on the foundation construction drawing. Concrete shall be Class SI according to Article 1020 of the Standard Specifications. Ground rods shall conform to BOE Material Specification 1465.

All excavation and restoration of parkways to original conditions shall be considered as part of this item. Dispose of excess material according to Article 202.03 of the Standard Specifications.

Method of Measurement. This Work will be measured per each foundation installed, complete and in place.

Basis of Payment. This Work will be paid for at the contract unit price of each for CONCRETE FOUNDATION FOR TYPE "P" BASE MOUNTED TRAFFIC SIGNAL CONTROLLER CABINET.

(CTE – 10/15/2004)

SIGNAL HEAD, POLYCARBONATE, LED, 1-FACE

Description. This item consists of furnishing and installing a traffic signal head or combination of heads on a street light pole, a traffic signal pole, a traffic signal post or on a Traffic signal monotube mast arm as shown on the plans, as specified herein, or as directed by the Engineer.

General Requirements. Perform work under this item in accordance with Sections 802 and 881 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials. The traffic signal head shall meet the requirements of BOE Material Specification 1493 for a "Traffic Signal" Twelve-Inch Single Face, Single or Multiple Section, Polycarbonate, LED or Incandescent", adopted March 20, 2000 with the exception that all traffic signal heads installed as part of this project shall be LED signal heads. The use of incandescent lamps is expressly prohibited. The sizes of the lenses shall be as indicated on the plans. The mounting brackets shall meet the requirements of BOE Material Specification 1495.

The material for a programmed head shall meet the BOE Material Specification 1496 for Optically Programmed Signal Heads.

The lamp for the optically programmed signal will be a General Electric Company product, 150 watt sealed beam lamp, with rated life of 6000 hours, or equivalent. The LED signals shall be equipped with the proper LED optical unit.

The type of installation shall 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 shall be as indicated in the plans and in the BOE Standard Drawings.

Each signal face shall be pointed in the direction of the approaching traffic that it is to control and shall 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. The optically programmed signal face shall be veiled in accordance with the visibility requirements at the direction of the Engineer.

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

Installation Requirements.

Pole Mounted. The signals shall be mounted using pole mounting brackets meeting BOE Material Specification 1495, banded to the pole with two strips of $\frac{3}{4}$ inch 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 shall be coated with a baked-on black finish. The mounting configuration connecting the signals to the mounting bracket shall consist of sections of $1\frac{1}{2}$ inch polycarbonate conduit of precise lengths, as indicated on the standard drawing, to create the designated structure, connected with cross fittings per BOE Standard Drawing 741.

Mast Arm Mounted. The signal shall be mounted on the mast arm using a mounting device meeting the requirements of BOE Material Specification 1463, at the position on the mast arm as indicated on the drawing in the manner shown on BOE Drawing 834. The Bracket shall be banded to the mast arm with the 5/8 inch banding as shown on BOE Drawing Number 834. The banding and clips shall have a baked-on black finish. The Bracket shall be located over a hole drilled into the mast arm for the installation of cable. The hole shall be reamed or filed to remove any sharp edges to burrs which might damage cable during installation or through vibration when the signals are in operation.

Cable. The Contractor shall provide and install a length of 8/C #18 flexible electrical cord, as per BOE Material Specification 1475, 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, shall be sufficient to match the requirements of the signal head being installed, and shall be connected in accordance with BOE Material Specification 1493, for the "Traffic Signal Twelve Inch Three or Single Section, One Way", or BOE Material Specification 1496, for "Optically Programmed Signals". Both ends of the cable length shall be carefully stripped of six inches (6") of jacket and one inch (1") of insulation, and each conductor properly tinned.

- a) Mast Arm Mounted Service Cable. The service cable from the signal heads shall enter the traffic signal mast arm through the hole from the mounting bracket, whence it shall 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, BOE Drawing Number 12268 A.
- b) Pole Mounted Service Cable. The service cable from the signal heads shall enter the pole through the bottom ULB-1 mounting bracket and enter the long sweep elbow to terminate by attachment to the terminal strip in the junction box in accordance with connector schematic, BOE Drawing Number 12268-A.

Color. Color shall be black conforming to City of Chicago Standard specifications. The signal head housings, mast arms, the pole mounting brackets, and the crosses shall be black in color as designated by the Engineer. When the signals are mounted on the pole, the mounting hardware shall be painted to match the pole.

Method of Measurement. This Work will be measured on a per each basis as installed and accepted by the Engineer and the Bureau of Electricity.

Basis of Payment. This Work will be paid for at the contract unit price each for SIGNAL HEAD POLYCARBONATE, LED, 1-FACE of sections and mounting type indicated.
(CTE – 10/28/2004)

PEDESTRIAN SIGNAL HEAD, POLYCARBONATE, 1 FACE, LED, BRACKET MOUNTED

Description. This item consists of furnishing and installing a pedestrian signal on a street light pole, a traffic signal pole or a traffic signal post as shown on the plans, as specified herein, or as directed by the Engineer. The signal may be installed as a single unit on a pole or in combination with other pedestrian signals or with traffic signals of various types and sizes. Specific installations and configurations are shown on BOE Drawing Numbers 834 and 835 entitled "Standard Traffic Signal Mounting Details".

Materials. The pedestrian signal head shall meet the requirements of BOE Material Specification 1494. All housing units shall be made of polycarbonate. Mounting hardware shall meet the requirements of BOE Material Specification 1495.

General Requirements. Perform work in accordance with Sections 800, 881, 1078.02 of the Standard Specifications, Bureau of Electricity Standards and the City of Chicago Electrical Code, except as herein modified.

The method of mounting shall be indicated on the plans. Each signal face shall be pointed in the direction of the marked cross-walk area for the pedestrians it is intended to control.

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

Installation Requirements.

The signal shall be mounted using pole mounting brackets meeting BOE Material Specification 1495, banded to the pole with two strips of ¾ inch 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 shall have a baked-on black finish. The mounting configuration connecting the signals to the mounting bracket shall consist of sections of 1½ inch polycarbonate conduit of precise lengths as indicated on the standard drawing to create the designated structure, connected with cross fittings per BOE Standard Drawing 741, as required.

The bottom mounting bracket shall be accurately located to cover a hole 1 inch in diameter for cable entrance drilled into the pole or standard at a height calculated to position the bottom signal face at a standard height of 10 feet, or a height indicated on the plans. The hole shall 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 shall be installed using the same opening as the traffic signal cord.

Cable.

The Contractor shall provide and install a length of 8/C #18 AWG flexible electric cord, per BOE Material Specification 1475, 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, shall be sufficient to match the requirements of the signal head being installed, and shall be so connected in accordance with BOE Material Specification 1494. Both ends of the cable shall be carefully stripped of six inches (6") of jacket and one inch (1") of insulation, and each conductor properly tinned. The cord shall be attached to the terminal block in the junction box in accordance with the terminal strip connector schematic, Bureau of Electricity Drawing Number 12268-A.

The service cord from the signal head shall 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.

Color. Color shall be black as indicated on the plans.

Method of Measurement. Each pedestrian signal head will be counted as a unit for payment.

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.
(CTE – 10/26/2004)

VIDEO SYSTEM DETECTION CAMERA, VIDEO DETECTION PROCESSOR

Description. This item consists of furnishing, installing, and testing a video system detection camera and a video system detection processor for vehicular traffic, complete with all mounting hardware, hybrid cable pigtails, and software required for a fully operational system that provides all the features and functions described herein shown on the plans or directed by the Engineer.

The video detection system shall accommodate present and future vehicular traffic system detection requirements for the City of Chicago.

The work shall include all shop drawings and sample submittals as required for the detection system. The work shall also include such items as identification tags for equipment and manuals for the operation and maintenance of the system.

The video camera shall be a Philips VPK351A Series camera that is fully compatible with all other components in the system. The camera shall be a 1/3 inch format monochrome interline transfer CCD camera with a signal-to noise ratio (SNR) of at least 50 dB. The camera shall have an integral IR filter. The camera shall provide a usable video image with an imager illumination of 0.0014 footcandles (0.014 lux) and full video output with an imager illumination of 0.0055 footcandles (0.055 lux). The video output shall be 1.0 V peak-to-peak into 75 ohms.

A power zoom lens shall be supplied with the camera. The zoom lens shall be continuously adjustable within a range of at least 6 mm to 60 mm. The lens shall have an automatic iris.

The camera shall be enclosed in a cylindrical aluminum housing. The housing shall have aluminum endcaps. The front endcap shall have a glass window with a heater to minimize fogging and condensation on the outside of the window. The rear endcap shall have a single multipin corrosion-resistant connector for video, power, and lens control wiring. The housing with endcaps installed shall meet the requirements of NEMA-4, IP65, Enclosure Type 3. The housing shall have a white, weather-resistant finish.

The assembled camera and housing shall be operational at external temperatures of -40°C to +50°C (-40°F to 122°F). A sunshield shall provided with the housing. The sunshade shall have a white, weather-resistant finish.

A hybrid cable pigtail shall be supplied with the camera assembly. The pigtail shall consist of an RG-59/U coaxial cable for the video signal, a multiconductor cable for power to the camera, and a multiconductor cable for zoom lens control. The hybrid cable shall be terminated on one end with a connector that mates with the multipin connector on the camera housing. The other end of the hybrid pigtail will be unterminated. The hybrid pigtail shall be sixty (60) feet in length.

Camera Video Processing Unit and Interface.

The video processor shall be a Peek Traffic VideoTrak-905 that is fully compatible with all other components in the system. The processor shall be capable of accommodating inputs from up to 8 monochrome cameras in NTSC format.

The video processor assembly shall meet or exceed NEMA TS-2 environmental specifications.

The video processor shall consist of a chassis into which up to ten (10) VME (VersaModule European) 3U modules and a power supply can be installed. A typical installation shall consist of either one or two video processor modules, one or two input/output modules, and a power supply.

The video processor module (VPM) shall be a 3U module. The VPM shall provide four (4) camera inputs for video detection and one (1) input for an additional video source. The camera inputs shall accept either monochrome (RS-170) or color (NTSC) inputs. Any of the video inputs shall be individually selectable to be routed to a video output connection for system setup or monitoring. The VPM shall be able to automatically select the five video inputs in a user-defined sequence and route each input sequentially to the output.

An input/output (I/O) module shall be supplied and installed with each VPM. The I/O module shall be a 3U module and shall provide 32 outputs and 16 inputs. The inputs and outputs shall be accessed through a D-subminiature connector for connection to the backpanel in the traffic signal controller cabinet. The I/O module shall support either 12V or 24V operation, selected by a jumper within the module, for compatibility with the traffic signal control equipment.

The power supply module shall operate on either 120VAC at 60 Hz or 240VAC at 50 Hz. The power supply shall include a 3-wire cord and grounded plug.

Method of Measurement. This Work will be measured on a per each basis as installed and accepted by the Engineer and the Bureau of Electricity.

Basis of Payment. This Work will be paid for at the Contract Unit Price each for VIDEO SYSTEM DETECTION CAMERA, VIDEO DETECTION PROCESSOR.

(CTE – 10/28/2004)

SIGN, MESSAGE, ELECTRICALLY ILLUMINATED, FIBER OPTIC, BRACKET MOUNTED

Description. This item consists of furnishing and installing a single faced, permanently illuminated, incandescent or fiber optic sign, bracket mounted on a street light or traffic signal pole, or on a traffic post at the location shown on the plans or as directed by the Engineer. The sign may be installed as a single unit or in combination with traffic or pedestrian signals. Specific installations and configurations are shown on BOE Standard Drawings 834 and 835.

General Requirements. Perform work in accordance with Sections 802 and 891 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials. The sign shall meet the requirements of BOE Material Specification 1518 for the particular sign specified. The mounting brackets shall meet BOE Material Specification 1495. The cable shall meet the applicable requirements of BOE Material Specification 1475.

Installation Requirements. Each sign shall be faced in the direction of the traffic it is intended to control. During construction and until the installation is placed in operation, the sign face shall be hooded. The hooding material shall be securely fastened so it will not be disturbed by inclement weather or wind. The sign shall be mounted using pole mounting brackets meeting BOE Material Specification 1495, banded to the pole with two strips of ¾ inch stainless steel banding 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 shall have a baked-on black finish. The mounting configuration connecting the sign to the mounting bracket shall consist of sections of 1½ inch conduit of precise lengths, as indicated on the standard drawing, to create the designated structure, connected with cross fittings per BOE Standard Drawing 741, as required.

When the sign is to be mounted on a square pole or flat surface, the bracket will be bolted to the flat pole or surface using a 3/8 inch drive stud where permissible or using a 3/8 inch stud in a tapped hole.

The bottom mounting bracket shall be accurately located to cover an opening 1 inch in diameter, for cable entrance, drilled into the pole or standard at a calculated height to position the bottom sign face at a standard height of fourteen feet and eight inches (14'-8"), or a height indicated on the plans. The opening shall be reamed or filed to remove all sharp edges or burrs which might damage cable during installation or through vibration when the sign is in operation.

The Contractor shall provide and install a length of flexible electrical cord meeting BOE Material Specification 1475, except that the cable shall be two-conductor. The cable shall be of sufficient length to extend without strain or stress from the sign head to the terminal strip in the junction box mounted on the pole. Both ends of the cable length shall 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 sign shall 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, BOE Drawing Number 12268-A.

Lamp Requirements. The Contractor shall supply and install one 25 watt, 120 volt incandescent lamp for each of the eight sockets in the sign.

Painting and Color. The sign housing, the pole mounting bracket, and the crosses are to be factory painted by the manufacturer with baked on enamel. Matte black shall be the color unless directed otherwise.

Method of Measurement. This Work will be measured as each fiber optic sign bracket mounted.

Basis of Payment. This Work will be paid for at the contract unit price each for SIGN, MESSAGE, ELECTRICALLY ILLUMINATED, FIBER OPTIC, BRACKET MOUNTED of the type specified.

(CTE – 10/26/2004)

SIGN, MESSAGE, ELECTRICALLY ILLUMINATED, FIBER OPTIC, MAST ARM MOUNTED

Description. This item consists of furnishing and installing a single faced, permanently illuminated, incandescent or fiber optic sign, mounted on a traffic signal mast arm at the location shown on the plans or as authorized by the Engineer. The sign may be installed as a single unit or in combination with traffic signals. Specific installations and configurations are shown on BOE Standard Drawings 834 and 835.

General Requirements. Perform work in accordance with Sections 802 and 891 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials. The sign shall meet the requirements of BOE Material Specification 1518 for the particular sign specified. The mounting bracket shall meet BOE Material Specification 1463. The cable shall meet the applicable requirements of BOE Material Specification 1475.

Installation Requirements. Each sign shall be faced in the direction of the traffic it is intended to control. During construction and until the installation is placed in operation, the sign face shall be hooded. The hooding material shall be securely fastened so it will not be disturbed by inclement weather or wind. The sign shall be mounted on the mast arm using mast arm mounting brackets meeting BOE Material Specification 1463, banded to the mast arm with 5/8" stainless steel banding secured with a stainless steel banding clip, as shown on BOE Standard Drawing 834. The banding and clips shall have a baked-on black finish. The bracket shall be placed over a 1" hole drilled into the mast arm for the installation of cable. The hole shall be drilled at the location indicated on the plans. The hole shall be reamed or filed to remove any sharp edges or burrs which might tend to damage cable during installation, or through vibration.

The Contractor shall provide and install a length of flexible electrical cord meeting BOE Material Specification 1475, except that the cable shall be two-conductor. The cable shall be of sufficient length to extend without strain or stress from the sign head to the terminal strip in the junction box mounted on the pole. Both ends of the cable length shall 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 sign shall enter the mast arm through the hole in the mast arm, whence it shall 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 at the terminal strip in the junction box in accordance with connector schematic, Bureau of Electricity Drawing Number 12268-A.

Lamp Requirements. The Contractor shall supply and install one 25 watt, 120 volt incandescent lamp for each of the eight sockets in the sign.

Painting and Color. The sign housing, the pole mounting bracket, and the crosses are to be factory painted by the manufacturer with baked on enamel. Matte black shall be the color unless directed otherwise.

Method of Measurement. This Work will be measured as each fiber optic sign mast arm mounted.

Basis of Payment. This Work will be paid for at the contract unit price each for SIGN, MESSAGE, ELECTRICALLY ILLUMINATED, FIBER OPTIC, MAST ARM MOUNTED of the type specified.

(CTE – 10/26/2004)

REMOVE EXISTING TRAFFIC SIGNAL EQUIPMENT

Description. This item consists of removing the existing traffic signal equipment including lighting mast arm, luminaires, and traffic signal cables at the intersections listed on the plans.

General Requirements. Perform work in accordance with Sections 800 and 1086 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Delivery to City. The traffic control items, except for traffic signal cable, are to be removed and remain the property of the City of Chicago. The Contractor shall deliver the 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 shall be removed

and become the property of the Contractor and shall be disposed of by him, outside the right-of-way, at his sole expense. The cost of cable removal shall be included in this item.

The Contractor shall provide three (3) final copies of State's form(s) GF-2, listing the quantities and type of equipment that is to remain the property of the City, including model and serial numbers where applicable. He shall also provide a copy of the Contract Plan, or special provisions, showing the quantities and type of equipment. The Contractor shall 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 in good condition.

Method of Measurement. Removal of existing traffic signal equipment will be counted as lump sum.

Basis of Payment. This Work will be paid for at the contract lump sum price for REMOVE EXISTING TRAFFIC SIGNAL EQUIPMENT.

(CTE – 10/15/2004)

REMOVE EXISTING HANDHOLE OR MANHOLE

Description. This item consists of breaking down an existing handhole or manhole and filling in the affected area to grade.

General Requirements. Perform work in accordance with Section 800 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

This Work shall consist of removing the frame and cover of an existing handhole or manhole, breaking down the handhole/manhole walls, removing large debris, and backfilling the hole with screenings or other approved material. Backfill shall be installed in 6 inch layers and tamped. If the handhole/manhole is in a parkway, the hole shall be filled level to the existing grade. The top six inches of fill shall be of an approved soil mixture. If the handhole/manhole is in sidewalk or in pavement, the sidewalk or pavement shall be restored under a different pay item. If the frame or cover is deemed re-useable by the Engineer, the frame and/or cover shall be delivered to the Bureau of Electricity at a location identified by the Engineer. Any debris, including the frame and cover shall be disposed of off-site in an approved manner. The Contractor shall pay for all disposal fees.

Method of Measurement. Each manhole/handhole removed will be counted as a unit for payment.

Basis of Payment. This Work will be paid for at the contract unit price per each for REMOVE EXISTING HANDHOLE OR MANHOLE.

(CTE – 10/15/2004)

REMOVE CONTROLLER FOUNDATION, TYPE A

Description. This item consists of removing a concrete foundation for a pedestal mounted traffic signal, a traffic controller, or a fire alarm cabinet, completely, or to a level two feet below the 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 shall be properly restored with dirt to the existing level.

If the foundation is in sidewalk, the sidewalk shall be restored under a different pay item and shall not be considered as part of this Work.

General Requirements. Perform work in accordance with Sections 800 and 842 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Method of Measurement. Each foundation that is removed and disposed of as indicated will be counted as a unit for payment.

Basis of Payment. This Work will be paid for at the contract unit price per each for REMOVE CONTROLLER FOUNDATION, TYPE A.

(CTE – 10/28/2004)

REMOVE TRAFFIC SIGNAL POLE FOUNDATION

Description. This item consists of removing a concrete foundation for a traffic signal pole to a level three feet below the grade, disposing of the debris off-site in an approved manner, backfilling the excavation with screenings or other approved backfill material, and reconstructing the surface area. If the foundation is in a parkway, the parkway shall be properly restored with soil to the existing level. If the foundation is in sidewalk, the sidewalk shall be restored to its original condition.

General Requirements. Perform work under this item in accordance with Sections 800 and 895.05 of IDOT's Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

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

Basis of Payment. This Work will be paid for at the contract unit price per each for REMOVE TRAFFIC SIGNAL POLE FOUNDATION.

(CTE – 10/26/2004)

REMOVE FOUNDATION FOR BASE MOUNTED CONTROLLER

Description. This item consists of removing a concrete foundation for a traffic signal controller, completely, or to a level two feet below the grade, disposing of the debris off-site in an approved manner, backfilling the excavation with screenings or other approved backfill material, and reconstructing the surface area. If the foundation is in a parkway, the parkway shall be properly restored with soil to the existing level. If the foundation is in sidewalk, the sidewalk shall be restored to its original condition.

General Requirements. Perform work in accordance with Sections 802 and 878 of the Standard Specifications, except as herein modified.

Basis of Payment. This work will be paid for at the contract unit price for REMOVE FOUNDATION FOR BASE MOUNTED CONTROLLER.

(CTE – 10/26/2004)

SPECIAL EXCAVATION AND REPLACEMENT FOR CONDUIT UNDER CTA TRACK

Description. This item consists of opening and restoring a section of existing pavement approximately eighteen inches (18") wide by eighteen feet (18') long which includes and encases street car rails attached to wooden ties, and excavating and backfilling a trench for the installation of conduit for electric cables. This operation shall be performed at the location indicated on the plans, or as directed by the Engineer with the direction of trench construction perpendicular to the CTA track line, and any single such trench shall be large enough for the placement of a minimum for four-four inch (4-4") conduit, if required, without additional pavement opening.

General Requirements. Perform work in accordance with Section 353 and 441 of the Standard Specifications, Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Materials. Concrete shall meet the requirements of the Standard Specification for Class SI Concrete.

Method of Construction. The size of the areas to be worked precludes the use of large machinery, permitting generally the use of a hand operated pneumatic (jack) hammer, a machine operated hydraulic bull point, or a concrete saw, with manual labor or a small back-hoe to load the broken concrete into a high-lift bucket or a dump truck for removal and off-site disposal of the spoil.

To maintain necessary lanes open to traffic, work should proceed in one lane at a time where possible. The use of a steel plate to cover cleared work areas shall be used to permit immediate resumption of vehicular traffic.

The concrete section of CTA roadbed containing rails and ties is approximately seventeen inches (17") thick and shall be removed to excavate the subgrade thereby requiring destructive removal of crossties which will not be replaced. Care shall be exercised to avoid cutting the CTA stranded copper ground drain cable which may or may not exist beneath the concrete. When this cable is cut, it shall be repaired to the satisfaction of the Engineer. Care shall be exercised to avoid damaging CTA conduit located midway between the sets of rails. The rails shall not be cut.

The trench under the rail section shall be excavated to a depth to provide thirty inches (30") cover over the conduit which will be installed and connected to conduit extending from foundations, manholes, or handholes as shown on the plans.

The trench shall be backfilled with sand for a depth of one foot and with other suitable fill to the bottom of the rails and compacted either by a mechanical or hand tamper meeting the approval of the Engineer.

The use of temporary steel plates to protect new concrete replacement shall be used to eliminate closing the roadway while the concrete cures.

Method of Measurement. This Work will be measured for payment in feet.

Basis of Payment. This Work will be paid for at the Contract Unit Price per lineal foot for SPECIAL EXCAVATION AND REPLACEMENT FOR CONDUIT UNDER CTA TRACK. Trenching and backfilling beneath the rails and temporary steel plates are also included in this pay item. The installation of the conduit will not be considered a part of this Work but will be paid for under a different unit cost schedule.

(CTE – 10/28/2004)

BUREAU OF ELECTRICITY SPECIFICATIONS

Specification No:

- 1368 - LUMINAIRE: WITH BUILT-IN BALLAST:FOR VERTICAL BURNING 310 WATT HIGH PRESSURE SODIUM VAPOR LAMP WITH TYPE II/TYPE III LIGHT DISTRIBUTION
- 1407 - POLE MOUNTED CAST ALUMINUM BOXES FOR TRAFFIC SIGNALS AND FIRE ALARM TERMINALS
- 1428 - THERMAL MAGNETIC CIRCUIT BREAKER
- 1440 - CABLE: SINGLE-CONDUCTOR, COPPER 600 VOLT ETHYLENE PROPYLENE INSULATION AND A HYPALON JACKET
- 1443 - SECONDARY RACK, 2 OR 3 WIRE, WITH INSULATORS
- 1447 - POLE: ANCHOR BASE, 3 AND 7 GAUGE, TAPERED TUBULAR STEEL, WITH HANDHOLE ENTRY
- 1450 - MAST ARMS: 4-, 8-, 12-, AND 15-FOOT: STEEL
- 1457 - SERVICE ENTRANCE, THREE CONDUCTOR, 600 VOLT, EPR INSULATED WITH HYPALON SHEATH OVERALL
- 1462 - RIGID STEEL CONDUIT (HOT DIPPED GALVANIZED)
- 1463 - TRAFFIC SIGNAL MOUNTING BRACKETS FOR MONOTUBE ARMS
- 1465 - GROUND RODS
- 1467 - ROD: ANCHOR, STEEL, WITH HARDWARE
- 1469 - TRAFFIC SIGNAL CONTROLLER AND CABINET LOCAL AND MASTER TYPES
- 1474 - CABLE: MULTIPLE CONDUCTOR, COPPER WIRE, 600 VOLT, ETHYLENE PROPYLENE RUBBER INSULATION, HYPALON JACKET
- 1475 - CORD: EIGHT CONDUCTOR NO. 16AWG., 600 VOLT 125 DEGREE C EPR INSULATION AND 105 DEGREE C JACKET
- 1482 - CABLE: TELECOMMUNICATIONS HYBRID FIBER OPTIC
- 1493 - TRAFFIC SIGNAL: VEHICULAR, TWELVE-INCH SINGLE FACE, SINGLE OR MULTIPLE-SECTION, POLYCARBONATE, LED OR INCANDESCENT
- 1494 - PEDESTRIAN TRAFFIC SIGNAL, 16 INCH WITH SYMBOLIC LED WALK/DON'T WALK LENSES POLYCARBONATE HOUSING
- 1495 - TRAFFIC SIGNAL MOUNTING BRACKET POLYCARBONATE, SIDE OF POLE
- 1496 - TRAFFIC SIGNAL: OPTICALLY PROGRAMMED, TWELVE-INCH SINGLE FACE, SINGLE OR MULTIPLE-SECTION
- 1518 - INTERNALLY ILLUMINATED SIGN

SPECIFICATION 1368
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
FEBRUARY 11, 1976

LUMINAIRE: WITH BUILT-IN BALLAST:FOR VERTICAL BURNING 310 WATT HIGH
PRESSURE SODIUM VAPOR LAMPWITH TYPE II/TYPE III LIGHT DISTRIBUTION

INTENT

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.

GENERAL

- (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.

DETAILED REQUIREMENTS

- (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 fourteen (14) business days after the bid opening, upon request of the Commissioner. 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 must not contain the lamp. 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 Contractor must warrant every luminaire against defects due to design, workmanship, or material developing within a period of eighteen (18) months 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 Contractor 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 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.
- (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 bked 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

- (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 20oF. 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 100o 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

- (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:

	<u>Type II Distribution</u>	<u>Type III Distribution</u>
No. of Luminaires (Contributing)	2	4
Spacing	85'- 1 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'

- (f) 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°.

**SPECIFICATION 1407
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
MARCH 15, 1995**

**POLE MOUNTED CAST ALUMINUM BOXES FOR TRAFFIC
SIGNALS AND FIRE ALARM TERMINALS**

SCOPE

This specification states the requirements for pole mounted, cast aluminum junction boxes to be used as enclosures for traffic signal and fire alarm multiple cable terminals.

GENERAL

- (a) Specifications. The junction boxes 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 Materials cited by ASTM Designation Number, of which the most recently published revisions will govern.
- (b) Drawings. The drawing mentioned herein is a drawing of the Department of Streets and Sanitation, Bureau of Electricity, and will be interpreted as part of these specifications.
- (c) Acceptance. Junction boxes not conforming to this specification will not be accepted.
- (d) Sample. One complete junction box of the manufacture intended to be furnished must be submitted within fourteen (14) business days after request by the Department of Streets and Sanitation, Bureau of Electricity. If the bidder supplying the sample is awarded a contract, the referenced sample will be credited as part of the order if it meets all requirements of this specification.
- (e) Workmanship. All junction boxes must be free of casting flaws and must have neat, smooth exterior surfaces. All holes must be accurately located and drilled to ensure interchangeability of all components.

DESIGN

- (a) Drawing. The junction box must conform in detail to the dimensions and requirements shown on drawing number 832.
- (b) Material. The body door and plate must be castings of non-heat treated aluminum silicon alloy conforming to ANSI alloy 443.0 of ASTM B26.

DETAIL REQUIREMENTS

- (a) **Assembly.** Each junction box must consist of the body, door with its gasket, flat plate with its gasket, terminal block mounting bracket and bottom gasket with its stainless steel hardware furnished as described below, all completely assembled, painted and ready for installation.
- (b) **Body.** The body must be cast as shown in drawing number 832. The top and bottom sides of the box where flat plates, or other fittings, will be attached, must be identically cast, machined flat, and drilled and tapped in accordance with dimensions shown. All fittings which fit on the top side must fit on the bottom side.
- (c) **Door.** The door must be cast as shown in drawing number 832. The door must be hinged at the left with stainless steel hinge pins and must open not less than 180 degrees to permit complete access to interior of the junction box. Two stainless steel Allen head machine screws, undercut and held captive, must hold the door closed and maintain positive pressure against a sponge neoprene gasket cemented in place completely around the door jamb. The door must be finished and painted prior to cementing the gasket into its groove in the door.
- (d) **End Plate.** A flat end plate must be furnished with each body casting. The plate must be drilled to align with tapped holes in the body casting and have a flush match with the periphery of the top and bottom body casting pads. The plate must have a properly fitted gasket and be held in place by four (4) stainless steel machine screws.
- (e) **Mounting Bracket.** A terminal block mounting bracket, as shown on drawing number 832, must be furnished and installed in each junction box. The bracket must be cast from ANSI alloy 443.0 per ASTM B26.
- (f) **Gaskets.** The gasketing between the body and the door must be of sponge neoprene and must be cemented in place after painting of the door. A cork gasket, 1/8 inch thick, must be used between the end plate and the body of the junction box on the top end and held in place by four (4) stainless steel screws. An identical cork gasket and four (4) stainless steel screws must be placed in a 6" x 4" metal fold kraft envelope, 32 sub., and placed within the box before shipping. This gasket with its screws will be used with the fitting used on the bottom end of the box.
- (g) **Hardware.** The hinge pins and all screws required for assembly of this junction box must be of stainless steel.
- (h) **Painting.** The exterior surfaces of the junction box must be properly cleaned and given one (1) coat of zinc chromate primer containing ten percent (10%) iron oxide and one (1) coat of green enamel. The color of the enamel must be green number 14110 of Federal Standard number 595. The primer and enamel must be of an approved grade and quality.

- (i) Packing. After the paint is thoroughly dry, and the junction boxes have been assembled, they must be suitably packed to prevent damage to painted surfaces during shipping and handling. All shipments must be fastened to, and shipped on, 48" x 48" hardwood, 4 way, non-returnable pallets. Total height must not exceed 64" and total weight must not exceed 2,000 pounds.

INSPECTION

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

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1428
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
SEPTEMBER 11, 1989**

THERMAL MAGNETIC CIRCUIT BREAKER

SUBJECT

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

GENERAL REQUIREMENTS

2. (a) Sample. One complete circuit breaker of each type and size, and of the manufacture intended to be furnished must be submitted upon request of the Commissioner within fourteen (14) business days after the bid opening date. If the contractor supplying the sample(s) delivered is awarded the contract, the sample(s) will be credited as part of the order. 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. Circuit breakers furnished under this specification must consist of the following types and sizes:
 - (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 insulating 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 677, 678 and 865.
- (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.

GUARANTEE

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

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1440
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
JANUARY 10, 1991**

**CABLE: SINGLE-CONDUCTOR, COPPER 600 VOLT ETHYLENE
PROPYLENE INSULATION AND A HYPALON JACKET**

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 either be installed in underground ducts or directly buried.

GENERAL

2. (a) Specifications. The cable shall 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-68-516
 2. IEEE Standard 383-1974
 3. ANSI-ASTM Standard E662-79
 4. ASTM Standard D-470-81
 5. U.L. 44
 6. U.L. 854
- (b) Acceptance. Cable not in accordance with this specification will not be accepted.
- (c) Reels. The cable shall be shipped on non-returnable reels. Reels shall be packaged with cardboard or other suitable material to prevent damage during shipping.
- (d) Warranty. The manufacturer shall 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 shall replace any cable failing during normal and proper use within two years of date of installation. All replacements under this warranty shall be made free of charge F.O.B. delivery point of the original contract. Lengths of cable having been replaced shall become the property of, and shall be returned to, the manufacturer F.O.B., City of Chicago.

CONSTRUCTION

3. This cable shall consist of a round copper conductor with a tight fitting, free stripping, concentric layer of Ethylene Propylene insulation and a concentric Hypalon jacket extruded in tandem with, and bonded to, the insulation. The cable shall be rated for continuous duty at 90 degree C operating temperature, 130 degree C emergency overload temperature and 250 degree C short circuit temperature.

CONDUCTOR

4. (a) Material. The conductor shall either be soft or annealed round copper wire.
- (b) Specifications. The conductor shall meet the requirements of ASTM B3, B8 or B258, as applicable.
- (c) Sizes. The conductor size shall be as stated in the PROPOSAL and in accordance with all requirements in Table A of this specification.
- (d) Stranding. The number of strands, shall be as indicted in Table A. Stranding shall meet the requirements of ASTM B8, Class B.

INSULATION

5. (a) Type. The insulation shall be Ethylene Propylene compound meeting the physical and electrical requirements specified herein.
- (b) Thickness. The insulation shall be circular in cross-section, concentric to the conductor, and shall 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. 1,200
 2. Elongation at rupture, minimum percent 250
- (d) Air Oven Exposure Test. After conditioning in an air oven at 121 + 1°C for 168 hours using methods of test described in ASTM-D 573:
 1. Tensile strength, minimum percent of unaged value 75
 2. Elongation at rupture, minimum percent of unaged value 75
- (e) Mechanical Water Absorption:

Gravimetric Method. After 168 hours in water at 70+ 1°C:

 1. Water absorption, maximum, milligrams per square inch 5.0

- (f) Cold Bend Test Requirements. The completed cable shall pass the "Cold-Bend, Long-Time Voltage Test on Short Specimens" of ASTM D-470 except that the test temperature shall be minus (-) 25°C.
- (g) Electrical Requirements:
 - 1. Voltage Test. The completed cable shall meet an A.C. and D.C. voltage test in accordance with ASTM D-470 and D-2655.
 - 2. Insulation Resistance. The completed cable shall have an insulation resistance constant of not less than 20,000 when tested in accordance with methods shown in ASTM D-470.

JACKET

- 6. (a) Type. The jacket shall be a Hypalon (Chlorosulfonated Polyethylene) compound meeting the physical and electrical requirements specified herein.
- (b) Thickness. The jacket shall be circular in cross-section, concentric with the insulation, shall 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 shall 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, shall apply. All tests shall 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 shall 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 shall be conducted on samples taken every 25,000 feet or fraction thereof of each conductor size. In no case shall 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 shall be witnessed by an engineer from the Bureau of Electricity. In addition to these tests, the engineer shall also witness tests on completed cables for approximately five percent (5%) of the cable. 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 by the engineer. The contractor shall include in his bid, the cost of travel, food and lodging for one (1) engineer. Travel for 150 miles or greater shall utilize a major airline. Lodging accommodations shall be equal to those provided at a Holiday Inn. The engineer shall be given ten (10) working day 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. Where the cable fails to conform to any of the tests specified herein, the following shall apply:
1. Insulation or Jacket Tests. Samples shall be taken from each reel and shall successfully conform to all tests specified herein. Reels from which samples fail to conform, will be rejected.
 2. Completed Cable (Reel) Tests. Any reel which fails to conform to testing will be rejected. Where a reel fails during witness testing, the engineer will select five (5) additional reels to witness test.
 3. Where five percent (5%) or more of the reels are rejected for any reason, the entire cable order will be rejected.

PACKAGING

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

1/c No. (conductor size) AWG-600V-90°C-EP/Hypalon

The legend shall be repeated at approximately eighteen (18) inch intervals on the outside surface of the cable parallel to the longitudinal axis of the conductor. A sequential footage marking shall be located on the opposite side from the legend.

- (b) When three conductors (3/C) are specified, the smaller of the conductors shall have a green colored jacket and the three conductors shall be triplexed with a 16"-18" lay. The jacket color shall not be unduly affected by cable installation, or prolonged exposure to either direct sunlight or moisture. Where the quantity of 3/C cable exceeds 80,000 feet, witness testing as outlined in section 7(c) shall apply.
- (c) Reels. The completed cable shall be delivered on sound substantial, non-returnable reels. Both ends of each length of cable shall be properly sealed against the entrance of moisture and other foreign matter by the use of clamp-on cable caps, such as the Reliable Electric Company neoprene cable cap No. 1405, or equal. The ends shall be securely fastened so as not to become loose in transit. Before shipment, all reels shall be wrapped with cardboard or other approved wrapping.
- (d) Footage. Each reel shall contain the length of cable as set forth in Table A of this specification. A tolerance limit of plus or minus five percent (+5%) shall be adhered to.
- (e) Reel Marking. A metal tag shall 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 shall 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 SIZE	STRANDING	INSULATION THICKNESS	JACKET THICKNESS	A-C TEST VOLTAGE	REEL LENGTH
AWG OR MCM	NO. OF STRANDS	MILS	MILS	VOLTS	FEET
8	7	45	15	5,500	2,000
6	7	45	30	5,500	2,000
4	7	45	30	5,500	2,000
2	7	45	30	5,500	1,000
0	19	55	45	7,000	1,000
00	19	55	45	7,000	1,000
000	19	55	45	7,000	1,000
0000	19	55	45	7,000	1,000
250	37	65	65	8,000	1,000

THIS SPECIFICATION SHALL NOT BE ALTERED

**SPECIFICATION 1443
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
MAY 13, 1991**

SECONDARY RACK, 2 OR 3 WIRE, WITH INSULATORS

SUBJECT

1. This specification covers the requirements for 2 and 3 wire secondary racks complete with insulators for attachment to street lighting poles for the purpose of supporting aerial circuit wires.

GENERAL

2. (a) Specifications. Each 2 or 3 wire secondary rack shall conform in detail to the requirements herein stated, and to the specifications of the American Society for Testing Materials, cited by A.S.T.M. Designation number, of which the most recently published revision shall govern. Secondary racks not conforming to this specification will not be accepted.
- (b) Sample. If requested, each bidder shall submit with his proposal one complete sample secondary rack with insulators for approval by the Commissioner. The approved sample will be credited as part of the order.
- (c) Guarantee. Secondary rack and pole clamps furnished under this specification must be guaranteed against failure from defects due to materials or workmanship for a period of one year after delivery.

SECONDARY RACK

3. (a) General Design. The secondary rack shall be the medium duty type with extended back. It shall be suitable for either 2 or 3 wire, as indicated in the bid proposal, with 8-inch spacing between centers of the clevises. Secondary racks furnished under this specification shall be similar and the approval equal of Joslyn Mfg. and Supply Co. part number J767 for a two-wire rack and J768 for a three-wire rack.
- (b) Back Section. The back section of the secondary rack shall be made from C1010, hot rolled carbon steel strip of 1/8 inch thick; the steel to conform with ASTM Specification A 107. The back shall be formed to the shape of an inverted trough, the flat portion of which shall be approximately 1-1/4 inches in width. Mounting slots, 11/16 inch by 1-1/4 inch, shall be longitudinally centered on the flat of the back section and located so as to coincide with the centers of the clevises, with additional slots provided at the top and bottom.

- (c) Clevises. Clevises shall be made from 1/8 inches thick steel strip of the same material as the back section, and so formed to fit the back snugly. The prongs of the clevis shall be approximately 4 inches apart and formed to the shape of an inverted trough, the flat portion of which shall be approximately 3/4 inch in width with the edges pitched at an angle of 30° with the flat portion. Each clevis shall be fabricated in such a manner that the pitched edges of both prongs shall slope in the same direction. The clevises shall be riveted to the back section with two (2) 5/16 inch steel rivets.
- (d) Rack Bolt. The rack bolt shall be a 9/16 inch diameter button head bolt of C1040 steel conforming with the requirements of ASTM Specification A 107, complete with a 1/4 inch by 2 inch brass cotter pin at the bottom end. Centerline of the rack bolt shall be located 4 inches out from the face of the back section.
- (e) Spool Insulators. Spool insulators shall be dry processed porcelain insulators similar to and the approved equal of Joslyn Mfg. and Supply Company No. J101 spool insulator.

FINISH

- 4. After fabrication, the secondary rack and all hardware shall be hot dip galvanized overall in accordance with the requirements of ASTM specification A-155.

TESTS

- 5. At the discretion of the Commissioner, secondary racks furnished under this specification shall be subject to determine compliance with the strength requirements of ANSI medium type secondary racks.

INSPECTION

- 6. An inspector representing the City shall have free entry at all times while work under this specification is being performed, to all parts of the manufacturer's plant which shall concern the manufacture of these secondary racks. The manufacturer shall afford the inspector, without charge, all reasonable facilities to satisfy him that the secondary racks are being furnished in accord with these specifications. The final inspection shall be made at point of delivery. Any secondary rack rejected or found defective because of material deficiency or workmanship shall be removed and disposed of by the contractor at his sole cost.

THIS SPECIFICATION SHALL NOT BE ALTERED

**SPECIFICATION 1447
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
REVISED OCTOBER 3, 2001**

**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 City, one completely assembled anchor-base pole of the manufacture intended to be furnished, must be submitted for review by the Commissioner within 14 working days of receiving Notice-to-Proceed.

- (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 three 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. The completed, unpainted masts must have smooth external surfaces free from protuberances, dents, cracks or other imperfections marring their appearance. Each mast must be straight and centered on its longitudinal axis.

- (d) Base. The mast base must be a 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 non-metallic screws or another type of non-seizing fastener, as approved by the Commissioner. The covers must enclose the anchor bolts and be secured in an approved manner. 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 to accept a 1/4" 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. Steel spring clips must be mounted to the tabs. These clips must be made to accept 1/4"- 20 machine screws. The 1/4"-20 allen head machine screws must have a button head. The screws must have a stainless steel core within a threaded nylon body. Other non-seizing types of screws and fasteners 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 non-metallic material subject to approval of the Commissioner. It must fit the doorframe closely and be dished so that it will stay in proper position even if its locking screws must be slightly loosened. The door must be drilled top and bottom to accept the 1/4"-20 Allen head machine screws which will fasten the door to the doorframe. All doors must be interchangeable. Alternate methods 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, 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. All welds of five percent (5%) of the poles in every lot must be inspected for penetration and soundness of the welds by the magnetic particle inspection method or by radiography. Acceptance or rejection will be governed by the same conditions as in 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) Exterior Coat. A thermosetting, weathering, 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 six (6) inches. 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%) Na Cl (by weight) solution at 95°F and 95% relative humidity without blistering. Before test, the panel must be scribed with an "X" down to bare metal.
- (h) Coating Measurement. Measurement of coating thickness must be done in accordance with SSPC-Pa 2-73T, "Measurement of Dry Paint Thickness with Magnetic Gauges," except that the lowest "single spot measurement" in an area of two square inches must be not less than 7.0 mils.
- (i) Color. Color must be gloss black unless otherwise noted in the order. A color sample must be submitted for approval prior to fabrication.

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. A record of every test must be made and a certified copy of the test record must be submitted to the Purchasing Agent before the masts are shipped. An engineer from the Bureau of Electricity, Engineering Division, must be present during the testing procedures, if so requested by the City.
- (b) Lot. Tests for deflection and set of the mast and of the mast arm supports must be made upon five (5%) percent of all the masts in every lot (two (2) min.). The selection of masts for testing must be random from the entire completed lot. If any of the masts in any lot fail to meet the test, an additional three (3%) percent of the masts of the same lot must be tested (two (2) min.). If any of these masts fail to meet the test requirements, the entire lot will be subject to rejection, except that the manufacturer may subject each mast in the lot to the test, and those which fulfill the requirement will be accepted. After testing, each base weld must be inspected by 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.

THIS SPECIFICATION MUST NOT BE ALTERED

TABLE A

POLE	GAUGE	BOLT CIRCLE	ANCHOR ROD	BASE PLATE	TEST LOAD	MAX. DEF.	MAX. SET	DRAWING
7.67"x12.5"x 34'6"	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"x 34'6"	3	15.0"	1.25"	1.5"	2000#	30"	2.5"	808
5.17"x10.0"x 34'6"	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

**SPECIFICATION 1450
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
REVISED SEPTEMBER 25, 2001**

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 14 business days upon request of the Commissioner.
- (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 654.
- (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. Five (5) percent of the mast arms of each size in every order must be tested for integrity of the welds.
- (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) percent of the mast 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 will be present during the testing procedures, if so requested by the City. The contractor must include in his bid, the cost of travel, food and lodging for one (1) engineer. Travel for 150 miles or greater must utilize a major airline. Lodging accommodations must be equal to those provided at a Holiday Inn. The engineer must be given ten (10) working days notice of travel arrangements.

PACKAGING

8. (a) General. The arms must be shipped in bundles. Each arm must be individually wrapped so that the arm can be bundled for shipping and unbundled for delivery without damage to the arm or its finish. Materials such as lumber (2"x4" min.), non-marring banding, and other appropriate bundling materials must be used to make a rigid, long lasting, bundle capable of being handled, shipped and stored without shifting or breaking of the contents. Any bundles, in which either the mast arms or packaging is received broken, damaged or with contents shifted, will not be accepted and it will be the responsibility of the supplier to return the bundle at no cost to the City. Each bundle must be capable of being lifted by a fork lift truck or crane and the bundles must be shipped in a flat bed truck to facilitate unloading. Each arm wrapping must be clearly labeled indicating the arm size, i.e. 8' STEEL LUMINAIRE MAST ARM.
- (b) The hardware must be shipped with each bundle. The package must be labeled and placed in a prominent position to facilitate accessibility, and must be attached to, or within, the bundle in such a manner as to assure safe delivery.
- (c) All mast arms will be delivered to the Bureau of Electricity storage yard at 4101 South Cicero Avenue in Chicago, or to another location within the City as indicated on the order.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1457
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
APRIL 23, 1992**

**CABLE: SERVICE ENTRANCE, THREE CONDUCTOR,
600 VOLT, EPR INSULATED WITH
HYPALON SHEATH OVERALL**

SUBJECT

1. This specification states the requirements for three conductor Ethylene Propylene Rubber (EPR) insulated, hypalon sheathed cable for installation on Commonwealth Edison service poles for the purpose of providing secondary feeds for Municipal street lighting 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-68-516
 - (2) IEEE Standard 383-1974
 - (3) ANSI-ASTM Standard E662-79
 - (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) Guarantee. The manufacturer must guarantee the cable to be first class material throughout. Notwithstanding other claims against them, if the cable be installed within one year of date of shipment, the manufacturer must replace any cable failing during normal and proper use within two years of installation. All replacements under this warranty must be made free of charge F.O.B. delivery point of the original contract. Lengths of cable having been replaced will become the property of and must be returned to the manufacturer F.O.B. City of Chicago.

CABLE

3. (a) Construction. This cable must consist of three (3) conductors separately insulated and color coded. Suitable fillers must be used to produce essentially 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-68-516. A binder tape must be used over the cabled conductor assembly and a hypalon sheath 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.
- (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, 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.

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 45 mils (.045") for both #4 AWG & #2 AWG and 55 mils (.055") for 1/o 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 a Hypalon (chlorosulfonated Polyethylene) compound meeting the physical and electrical requirements specified herein.
- (b) Thickness. The jacket must be circular in cross-section, concentric with the insulation, must have an average thickness not less than 80 mils (.080") 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 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 5,000 feet or fraction thereof of each conductor size. In no case must less than two (2) samples be taken.
- (c) Witness Tests. Where the quantity of cable on a single purchase order is 7,500 feet or more, all insulation and jacket tests must be witnessed by an engineer from the Bureau of Electricity. In addition to these tests, the engineer must also witness tests on completed cables for approximately five percent (5%) of the cable. 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 by the engineer. 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. Where the cable fails to conform to any of the tests specified herein, the following must apply:
 - (1) Insulation or Jacket Tests. Samples must be taken from each reel and must successfully conform to all tests specified herein. Reels from which samples fail to conform, will be rejected.
 - (2) Completed Cable (Reel) Tests. Any reel which fails to conform to testing will be rejected. Where a reel fails during witness testing, the engineer will select two (2) additional reels to witness test.
 - (3) Where two (2) or more of the reels are rejected for any reason, the entire cable order will be rejected.

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-EP/Hypalon 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, 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.
- (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/o 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.

THIS SPECIFICATION MUST NOT BE ALTERED

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)	Commodity Code
8	750	7	4.5	1500	55	80	6078
4	950	7	4.5	1000	55	80	6074
2	1100	7	4.5	1000	65	80	6072
1/0	1400	19	5.5	500	80	95	6070

* First six digits of Commodity Code Number for all sizes: 31-4686

**SPECIFICATION 1462
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
AUGUST 7, 1992**

**RIGID STEEL CONDUIT
(HOT DIPPED GALVANIZED)**

1. SCOPE

This specification describes rigid steel conduit, zinc coated.

2. GENERAL REQUIREMENTS

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.

3. STANDARDS

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 244. 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.

4. STEEL

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.

5. THREADING AND CHAMFERING

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.

6. ZINC COATING

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.

7. COUPLINGS

Couplings must comply with the following requirements:

- (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 ½ inch and larger sizes may be taper-tapped.

8. PACKING AND IDENTIFICATION

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.

9. TEST AND INSPECTION

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 ½ 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 ½ inches.

Tests on sizes other than ½ inch may be conducted within one year after the time of manufacture. If such tests are conducted, the conduit must be bent into a quarter of a circle around a mandrel, the radius of which is six times the nominal size of the conduit.

One of the following three test methods must be employed for measuring the thickness or extent of the external zinc coating on conduit:

- (a) Magnetic test.
- (b) Dropping test.
- (c) Preece test (Material which will withstand four 1-minute immersions will be considered as meeting requirements as follows; the zinc content of the coating on the outside surface must be equivalent to a minimum thickness of 3.4 mils).

All tests and inspections must be made at the place of manufacture prior to shipment unless otherwise specified, and must be so conducted as not to interfere with normal manufacturing processes.

Each length of conduit must be examined visually both on the outside and inside to determine if the product is free from slivers, burrs, scale or other similar injurious defects (or a combination thereof), and if coverage of the coating is complete.

If any samples of rigid steel conduit tested as prescribed in this specification should fail, two additional samples must be tested, both of which must comply with the requirements of the specification.

All pipe which may develop any defect under tests, or which may before testing or on delivery be found defective, or not in accordance with these specifications, must be removed by the Contractor at his own expense; and such pipe so removed by the Contractor must be replaced by him within ten (10) days of such rejection with other pipe which will conform to these specifications.

TABLE 1

Design Dimension and Weights of Rigid Steel Conduit

Nominal or Trade Size of Conduit	Inside Diameter	Outside Diameter	Wall Thickness	Length Without Coupling	Minimum Weight of Ten Unit Lengths With Couplings
<u>(Inches)</u>	<u>(Inches)</u>	<u>(Inches)</u>	<u>(Inches)</u>	<u>(Feet & Inches)</u>	<u>(Pounds)</u>
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 percent for the 2-inch and larger sizes.

Wall thickness: - 12 1/2 percent

TABLE 2

Dimensions of Threads

Nominal or Trade Size of Conduit (Inches)	Threads per Inch	Pitch Diameter at end of Thread (Inches) Tapered 3/4 Inch per foot	Length of Thread (Inches)	
			Effective L2	Overall L4
1/2	14	0.7584	0.53	0.78
3/4	14	0.9677	0.55	0.79
1	11 1/2	1.2136	0.68	0.98
1 1/4	11 1/2	1.5571	0.71	1.01
1 1/2	11 1/2	1.7961	0.72	1.03
2	11 1/2	2.2690	0.76	1.06
2 1/2	8	2.7195	1.14	1.57
3	8	3.3406	1.20	1.63
3 1/2	8	3.8375	1.25	1.68
4	8	4.3344	1.30	1.73

NOTE: The applicable tolerances are:

Threaded Length (L₄ Col 5): Plus or minus one thread

Pitch Diameter (Col 3): Plus or minus one turn is the maximum variation permitted from the gaging face of the working thread gages. This is equivalent to plus or minus one and one half turns from basic dimensions, since a variation of plus or minus one half turn from basic dimensions is permitted in working gages.

TABLE 3

Designed Dimensions and Weights of Couplings

Nominal or Trade Size of Conduit <u>(INCHES)</u>	Outside Diameter <u>(INCHES)</u>	Minimum Length <u>(INCHES)</u>	Minimum Weight <u>(POUNDS)</u>
1/2	1.010	1-9/16	0.115
3/4	1.250	1-5/8	0.170
1	1.525	2	0.300
1 1/4	1.869	2-1/16	0.370
1 1/2	2.155	2-1/16	0.515
2	2.650	2 1/8	0.671
2 1/2	3.250	3-1/8	1.675
3	3.870	3-1/4	2.085
3 1/2	4.500	3-3/8	2.400
4	4.875	3-1/2	2.839

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1463
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
REVISED JUNE 22, 2001**

**TRAFFIC SIGNAL MOUNTING BRACKETS FOR
MONOTUBE ARMS**

SUBJECT

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

- (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. One complete mounting bracket must be submitted within fourteen (14) business days upon request of the Commissioner. 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 monotube arms herein described, as demonstrated by a submittal list of comparable projects.

DESIGN

- (a) General. The mounting bracket must be designed such that no portion of the bracket is put into tension when it is attached to either the mast arm or to the signal support tube. All materials must be corrosion resistant and designed to be structurally sound.
- (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 3M optically programmed signal heads; and with signs.

- (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.
- (f) 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 1/2" diameter cable between the mast arm and the signal face.
- (g) Banding. Where banding is used to attach the mounting bracket to the mast arm, the banding must be 3/4" x 42" stainless steel.
- (h) Castings. Where castings are used for the brackets, they must be smooth and free of defects.

TESTING

- (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. All tests must 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

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.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1465
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
REVISED AUGUST 28, 1995**

GROUND RODS

SUBJECT

1. This specification states requirements for ground rods to be used for ground connections in street lighting, traffic signal, fire alarm, 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.

DESIGN

3. (a) Ground rods must be made of mild steel core suitable for driving into the earth without deformation.
- (b) A heavy, uniform covering of electrolytic copper must be metallically bonded to the steel core to provide a corrosion resistant, inseparable bond between the steel core and the copper overlay.
- (c) The rod must be processed to work harden the copper providing a scar resistant surface.
- (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 end.
- (f) All ground rods must be three-quarter inches (3/4") in diameter. The length must be as specified elsewhere. The length of the rod must be clearly and permanently marked near the top of the rod (chamfered end).
- (g) All ground rods must conform to U.L. 467 and must be listed as such.
- (h) All ground rods must be supplied with a Blackburn G6 clamp, or equivalent.

ACCEPTANCE

4. (a) The contractor must furnish one sample of the ground rod proposed to be furnished within fourteen business days from receipt of notice. The approved sample must be the standard, in all respects, to which all ground rods furnished must conform. The accepted ground rod will be credited as part of the order.
- (b) The sample ground rod must be delivered to the Engineer of Electricity, 2451 S. Ashland Avenue, Chicago, Illinois 60608.
- (c) Ground rods not accepted must be removed at the sole expense of the contractor.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1467
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
MAY 12, 1993**

ROD: ANCHOR, STEEL, WITH HARDWARE

SUBJECT

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

GENERAL

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

ANCHOR ROD

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

HARDWARE

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

FINISH

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

TESTS

6. At the discretion of the Commissioner, anchor rods and hardware furnished under this specification will be subject to testing to determine compliance with the materials physical requirements.

INSPECTION

7. Final inspection must be made at point of delivery. Any anchor rods and hardware rejected must be removed by the Contractor at his sole expense.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1469
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
REVISED JUNE 1, 2000**

**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 fourteen (14) 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 contractor 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 contractor 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 arrestor. The gas type arrestor 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.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1474
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
MARCH 15, 1995**

**CABLE: MULTIPLE CONDUCTOR, COPPER WIRE, 600 VOLT, ETHYLENE PROPYLENE
RUBBER INSULATION, HYPALON JACKET**

SUBJECT

This specification states the requirements for a multiple cable to be installed in underground conduits and uses to distribute electrical energy to operate automatic traffic control equipment at street intersections within the City of Chicago.

GENERAL

- (a) Specification. 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, in which the most recently published revision will govern.
- (b) Acceptance. Cable not conforming to this specification will not be accepted.
- (c) Reels. The cable must be shipped on non-returnable reels. No charge should be made for wood lagging.
- (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. Lengths of cable having been replaced will become the property of and must be returned to the manufacturer F.O.B. City of Chicago.

CABLES

- (a) Construction. 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 neoprene or hypalon 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 (inches)</u>
Seven	0.65
Ten	0.80
Fourteen	0.85
Nineteen	0.95
Twenty Two	1.10

- (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

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

- (a) Material. Round, soft or annealed, copper wire.
- (b) Size. Cables must be made up of conductor sizes as set forth in Table A above. The Number 6 AWG conductors must be seven (7) strand, and the Number 10 AWG conductors must be solid.

INSULATION

- (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
#6	7	2	45
#10	1	2	25
#12	1	7	25
#12	1	10	25
#12	1	14	25
#12	1	19	25
#12	1	22	25

- (c) Physical Properties. Initial Value.
Tensile Strength 1200 psi minimum
Elongation at Rupture.....250% minimum
- (d) Physical Properties. After Aging.
- (1) After 168 hours in air oven at 121 degrees C:
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.
- (1) 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 degrees C 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°C.
- (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

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

- (a) Material. The jacket must be heavy duty neoprene or hypalon (Chlorosulfonated Polyethylene) meeting the Physical and electrical requirements specified herein.
- (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 No. 4 AWG	5/64 inch
(2) Two-Conductor No. 6 AWG	5/64 inch
(3) Two-Conductor No. 10 AWG	4/64 inch
(4) Seven-Conductor	3/64 inch
(5) Ten-Conductor	4/64 inch
(6) Fourteen-Conductor	4/64 inch
(7) Nineteen-Conductor	4/64 inch
(8) Twenty-Two Conductor	5/64 inch
- (d) Initial Physical Requirements:
 - 1. Tensile strength minimum PSI..... 1800
 - 2. Elongation at rupture, minimum percent 300
- (e) Air Oven Exposure Test. After conditioning in an air oven at $121^{\circ} \pm 10^{\circ}$ 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 $70^{\circ} \pm 1^{\circ}$ C:
 - 1. Milligrams 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

- (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. In addition to these tests, the engineer must also witness tests on completed cables for approximately five percent (5%) of the cable. Included in these tests will be a 70,000 BTU per hour flame tests in accordance with IEEE 383. Reels to be tested will be selected a random by the engineer. 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. Where the cable fails to conform to any of the tests specified herein, the following must apply:
 - (1) Insulation or Jacket Tests. Samples must be taken from each reel and must successfully conform to all tests specified herein. Reels from which samples fail to conform, will be rejected.
 - (2) Completed Cable (Reel) Tests. Any reel which fails to conform to testing will be rejected. Where a reel fails during witness testing, the engineer will select five (5) additional reels to witness test.
 - (3) Where five percent (5%) or more of the reels are rejected for any reason, the entire cable order will be rejected.

PACKAGING

- (a) Reels. The completed cable must be delivered on sound substantial, nonreturnable reels. Both ends of each length of cable must be properly sealed against the entrance of moisture and other foreign matter by the use of clamp-on cable caps, such as the Reliable Electric Company neoprene cable cap No. 1405, or equal. The ends must be securely fastened so as not to become loose in transit. Before shipment, complete 2 x 4 lagging must be applied to all reels.
- (b) Footage. Each reel must contain the length of cable as set forth below. A tolerance limit of plus or minus five percent ($\pm 5\%$) must be adhered to.
 - (1) Two-Conductor 2000 feet
 - (2) Seven-Conductor 2000 feet
 - (3) Ten-Conductor 2000 feet
 - (4) Fourteen-Conductor 2000 feet
 - (5) Nineteen-Conductor 1000 feet
 - (6) Twenty-two 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) Two-Conductor No. 6 AWG	31-4686-5808
(3) Two-Conductor No. 10 AWG	31-4686-5510
(4) Seven-Conductor	31-4682-5620
(5) Ten-Conductor	31-4682-5630
(6) Fourteen-Conductor	31-4682-5640
(7) Nineteen-Conductor	31-4682-5645
(8) Twenty-two Conductor	31-4682-5650

TABLE A COLOR CODE CONDUCTOR IDENTIFICATION

Base Color	First Tracer	Second Tracer	2 (# 6)	2 (# 4)	7	10	14	19	22
White	Black	Red	--	--	--	--	--	12	12
White	Red	Green	--	--	--	--	--	12	12
Black	--	--	6	4	12	12	12	12	12
White	--	--	6	4	12	12	12	12	12
Red	--	--	--	--	12	12	12	12	12
Green	--	--	--	--	12	12	12	12	12
Orange	--	--	--	--	12	12	12	12	12
Blue	--	--	--	--	12	--	12	12	12
White	Black	--	--	--	12	--	--	--	12
Red	Black	--	--	--	--	12	12	12	12
Green	Black	--	--	--	12	12	12	12	12
Orange	Black	--	--	--	--	12	12	12	12
Blue	Black	--	--	--	--	12	--	--	--
Black	White	--	--	--	--	--	--	--	12
Red	White	--	--	--	--	--	12	12	12
Green	White	--	--	--	--	--	12	12	12

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1475
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
MARCH 15, 1995**

**CORD: EIGHT CONDUCTOR NO. 16AWG., 600 VOLT
125 DEGREE C EPR INSULATION AND 105 DEGREE C JACKET**

SUBJECT

1. This specification states the requirements for an eight (8) conductor number 16AWG, electrical cable, to be installed in conduit and used to electrically energize traffic signal faces at street intersections within the City of Chicago.

SCOPE

2. This specification sets forth construction details and test requirements of the cable to be furnished. 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

3. (a) SPECIFICATIONS. The cable must conform in detail to the requirements herein stated, and to the Specifications and Methods of Test of the American Society for Testing and Materials cited by ASTM Designation Number, the Underwriters Laboratories, Inc. Standard or Style number and any other recognized Standardization group's specifications referred to by the appropriate designation, of which the most recently published revision will govern.
- (b) ACCEPTANCE. Cable not conforming to this specification will not be accepted.
- (c) WARRANTY. The manufacturer must warrant the cable to be first class material throughout. In addition to any other claims against them, if the cable is installed within six months of date of shipment, the manufacturer must replace any cable failing during normal and proper use within two years of date of installation. All replacements under this warranty must be made free of charge F.O.B. delivery point of the original contract. Lengths of cable having been replaced will become the property of, and must be returned to, the manufacturer F.O.B., City of Chicago.

CABLE

4. (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

5. (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 125 degrees C CPE" 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

6. (a) **MATERIALS.** 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) or ASTM B-189 (lead or lead-alloy 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

7. (a) **TYPE.** The insulation must be an easily strippable ethylene propylene rubber compound meeting or exceeding the requirements of ICEA S-68-516 and the additional requirements of this specification.
- (b) **RATING.** The insulation must be rated for continuous duty at 125 degrees C in accordance with U.L. AWM Style 3400.
- (c) **THICKNESS.** The insulated conductor must be circular in cross-section, concentric to the conductor, with a nominal insulation thickness of 0.031 inches (2/64") and a minimum spot thickness of 90% of the nominal thickness.

(d) INITIAL PHYSICAL REQUIREMENTS:

1. Tensile strength, min., PSI..... 1,600
2. Elongation at rupture, min. % 250

(e) AIR OVEN EXPOSURE TEST. After conditioning in an air oven at 158 ± 1 degree C for 168 hours using methods of test described in ASTM-D 573:

- Tensile strength, minimum percent
of unaged value 85
- Elongation at rupture, minimum
Percent of unaged value 65

(f) MECHANICAL WATER ABSORPTION:

1. GRAVIMETRIC METHOD. After 168 hours in water at 70 ± 1 degree 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 degrees 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 $158 \text{ degrees C} \pm 1 \text{ degree C}$. 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

8. (a) TYPE. The jacket must be a thermosetting chlorinated polyethylene (CPE) compound meeting the physical and electrical requirements specified herein. In lieu of CPE, the contractor may supply a chlorosulfonated polyethylene (hypalon) compound meeting these requirements.

- (b) RATING. The jacket must be rated for continuous duty at 105 degrees C.
- (c) THICKNESS. The jacket must be circular in cross-section, concentric with the insulation, must have an average thickness not less than 45 mils and a spot thickness not less than ninety percent (90%) of the average thickness.
- (d) INITIAL PHYSICAL REQUIREMENTS:
 - 1. Tensile strength minimum PSI..... 1800
 - 2. Elongation at rupture, minimum percent..... 300
- (e) AIR OVEN EXPOSURE TEST. After conditioning in an air oven at 121 ± 1 degree C for 168 hours for hypalon or 136 ± 1 degree C for CPE:
 - 1. Tensile strength, minimum percent of unused value 75
 - 2. Elongation at rupture, minimum percent of unaged valued 55
- (f) MECHANICAL WATER ABSORPTION. After 168 hours at 70 ± 1 degree C:
 - 1. Milligrams per square inch, maximum 20

TESTING

- 9. (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. In addition to these tests, the engineer must also witness tests on completed cables for approximately five percent (5%) of the cable. Reels to be tested will be selected at random by the engineer. 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. Where the cable fails to conform to any of the tests specified herein, the following must apply:
 - 1. Insulation or Jacket Tests. Samples must be taken from each reel and must successfully conform to all tests specified herein. Reels from which samples fail to conform, will be rejected.
 - 2. Completed Cable (Reel) Tests. Any reel which fails to conform to testing will be rejected. Where a reel fails during witness testing, the engineer will select five (5) additional reels to witness test.
 - 3. Where five percent (5%) or more of the reels are rejected for any reason, the entire cable order will be rejected.

PACKAGING

- 10. (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.

SPECIFICATION 1482
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
MARCH 20, 1997

CABLE: TELECOMMUNICATIONS
HYBRID FIBER OPTIC

MATERIALS

1. (a) Hybrid fiber optic cable
The cable must meet, as a minimum, the following specifications and conform with the latest issue of Bellcore TR-TSY-00020: Generic requirement for Optical Fiber and Optical Fiber Cables, ANSI/EIA-472: Generic Specification of Fiber Optic Cables, and REA-PE-90; and appropriate Sectional Specifications thereof.
- (b) Cable Construction
Cable construction, other than as specified, must be approved by the ENGINEER.
 1. The cable must be constructed entirely from dielectric material.
 2. A cable suitable for either direct installation into a duct bank or conduit must be supplied.
 3. The cable must be of gel-filled, loose tube construction with up to 12 buffer tubes wrapped around a dielectric central strength member. All fiber(s) must be contained within buffer tubes, and each buffer tube must have an inside diameter much greater than the total diameter(s) of the fibers(s) it supports.
 4. Each fiber or group of fibers must be free-floating within the tubes such that all mechanically or environmentally induced stress placed upon the cable is de-coupled from the fibers. The air within the buffer tubes must be displaced with a gel to prevent entry by water and to facilitate free movement of the fibers(s) within.
 5. The buffer tubes must be color coded in compliance with EIA/TIA-598; Color Coding of Fiber Optic Cables.
 6. Cables constructed of less than six fibers must have a buffer tube provided for each fiber: cables constructed of more than six fibers may have several fibers occupy a buffer tube, with equal distribution of fibers as far as practicable. All fibers must be color coded in compliance with EIA/TIA-598: Color Coding of Fiber Optic Cables. Single-mode and multimode fibers must not occupy the same buffer tube.

7. In buffer tubes containing multiple fibers, the colors must be stable during temperature cycling and not subject to fading or smearing onto each other or into the gel filling material. Colors must not cause fibers to stick together.
8. The cable must have an interstitial filing between the buffer tubes and throughout the remainder of the cable to prevent entry of water.
9. A binder wrapping strength member of aramid fibers must be provided as a final layer prior to application of the outer jacket.
10. The cable must be provided in continuous lengths. Each fiber must be pulled from the same optical waveguide form and must be free of splices. Each optical fiber must consist of a doped silica core surrounded by a concentric silical cladding; the use of any other material must be approved by the CITY.
11. A permanent marking must be employed on the outer jacket of the cable which must show the date of manufacture and the manufacturer's name. A numerical sequence must be marked on the outer jacket, at intervals no greater than ten (10) feet to facilitate determination of length of cable and amount of cable remaining on the reel. The height of the marking must be 2.5 mm nominal.
12. All optical fibers must be 100% attenuation tested at the factory for compliance with performance specifications described herein. The attenuation of each fiber must be provided with each cable reel.
13. The outer jacket must be constructed of medium density polyethylene, minimum jacket thickness of 1.4 mm. Jacketing material must be applied directly over the tensile strength members and flooding compound. The outer jacket must be UV and fungus resistant.

(c) Single Mode Optical Specifications

Optical Wavelength	1,300nm and 1.550 nm
Optical Attenuation	@ 1,300 nm: 0.7 dB/km @ 20 C @ 1,550 nm: 0.6 dB/km @ 20 C
Optical Dispersion	@ 1,300 nm: 3.5-4.5 psec/nm-km @ 1,550 nm:(\leq) 20 psec/nm-km
Zero-Dispersion Wavelength	1300 to 1320 nm, nominal
Zero Dispersion Slope	\leq 0.092 ps/nm ² -km
Fiber Core Diameter	8.3 um, typical
Fiber Coating Diameter	250+/-10 um
Fiber Cladding Diameter	125+/-2 um
Core to Cladding Offset	\leq 1.8 um
Cladding Non-Circularity	\leq 1.0%
Spot Size	9.3+/-0.5 UM @ 1300 nm 10.5+/-1 UM @ 1550 nm
Cutoff Wavelength	\leq 1250 nm

(d) Multimode Optical Specifications

Operational Wavelength	850 nm and 1,300 nm
Optical Attenuation	
@850 nm:	400 MHZ-km @ 20 C
@ 1,300 nm:	400 MHZ-km @ 20 C
Fiber Core Diameter	62.5 um +/-3.0 um
Fiber Coating Diameter	250 +/-15 um
Fiber Cladding Diameter	125 +/-2.0 um
Core to Cladding offset	<=3.0 um
Cladding Non-Circularity	<=6.0%
Numerical Aperture	0.275+/0.015
Index	Graded Index

(e) Hybrid Cable Mechanical Specifications

Crush Resistance	5,000 N/m. length of cable
Cable Outside Diameter	0.50' nominal
Minimum Bending Radius:	
Installation	20 times the cable diameter
Static	10 times the cable diameter
Temperature:	
Installation	-30 C to + 70 C
Storage/Operation	-40 C to + 70 C
Humidity	0 to 100%
Tensil Strength:	
Installation	2,700 N (600 ibf)
Static	600 N (125 ibf)

FIBER OPTIC PIGTAILS

2. The optical pigtail provided under this Contract must consist of multiple fibers, factory connectorized on one end, suitable for installation in an outdoor duct run. Each fiber must be individually jacketed, with aramid yarn fibers between the fiber and the sub-jacket. The fibers must then be contained in a medium density polyethylene outer jacket. The multi-fiber pigtail must be provided in eight (8) multimode fibers/configuration.

The factory installed ST connectors furnished as part of pigtails must meet or exceed the requirements for approval connectors specified herein. There must be a S-T type connector installed on all eight (8) multi-mode Fiber Optic Pigtails will be determined on Sub-orders placed.

The cable must be suitable for installation in outdoor manholes with water and/or ice.

Each jacketed fiber must have a tensile strength in excess of 50 lbs.

**SPECIFICATION 1493
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
MARCH 20, 2000**

**TRAFFIC SIGNAL: VEHICULAR, TWELVE-INCH
SINGLE FACE, SINGLE OR MULTIPLE-SECTION,
POLYCARBONATE, LED OR INCANDESCENT**

1. GENERAL REQUIREMENTS

- 1.1 This specification states the requirements for twelve-inch, single face, single and multiple-section, traffic signals with polycarbonate housings, using LED or incandescent light source, for use in the traffic control system of the City of Chicago. Units include red ball, yellow ball, green ball, red arrow, yellow arrow, and green arrow.
- 1.2 Sample and Certified Test Reports. One complete signal, fully assembled and wired, of the manufacture proposed to be furnished, must be submitted along with the required certified test reports, within fourteen (14) working days upon request of the Commissioner. 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 Definitions. Where referenced in the specification, the following definitions will apply:
- 1.4.1 Approval. Approval will mean approval in writing by the Commissioner or his/her duly authorized representative.

2. MATERIALS AND EQUIPMENT REQUIREMENTS

- 2.1 The traffic signal heads must conform to ITE Standard "Vehicle Traffic Control Signal Heads" (VTCSH), in which the most recently published revisions 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 deg. F	ASTM D 1525
Brittleness temp.	Below-200 deg. 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.
- 2.2 The traffic signal heads must be provided with incandescent and/or LED optical units as specified in the PROPOSAL or Contract Plans.
- 2.2.1 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.

2.2.2 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.

2.3 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 Tracer	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 (1/2") of insulation and tinned.

- 2.4 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.
- 2.5 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.
- 2.6 Gaskets. Wherever necessary to make a completely dustproof, moistureproof and weatherproof assembly of the housing and optical system, approved type gaskets of neoprene or silicone rubber must be provided.
- 2.7 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.
- 2.8 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 "TRAFFIC SIGNAL, TWELVE INCH, POLYCARBONATE, LED OPTICS" and the number of Sections as required, the color and indication types, the name of the manufacturer, the pertinent Contract Number and the appropriate City Commodity Code Number.

3. TESTING AND DOCUMENTATION REQUIREMENTS

- 3.1 Documentation. The contractor must provide certified manufacturing and testing documentation to demonstrate that the traffic signals being supplied meet or exceed the specification requirements. The LED Optical Units must be tested by an independent and certified testing laboratory.
- 3.2 Inspection. The signals will be subject to inspection at the discretion of the Commissioner. Final inspection must be made at point of delivery. Any signal rejected must be removed and disposed of by the contractor at his sole cost.
- 3.3 Warranty. The contractor 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 first three (3) years of the warranty period, the Contractor must repair or replace such defects and failures at no expense to the City and reimburse the City for any labor costs associated with replacing defective LED units. In the event defects or failures occur in the LED units during the last four (4) years of the warranty period, the contractor must repair and/or replace all defective materials at no expense to the City. This warranty must be evidenced by a letter or certificate of warranty submitted to the City at the time 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.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1494
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
MARCH 20, 2000**

**PEDESTRIAN TRAFFIC SIGNAL, 16 INCH
WITH SYMBOLIC LED WALK/DON'T WALK LENSES
POLYCARBONATE HOUSING**

1. GENERAL REQUIREMENTS

- 1.1 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.
- 1.2 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 fourteen (14) working days upon request of the Commissioner. 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 Definitions. Where referenced in the specification, the following definitions will apply:

1.4.1 Approval. Approval will mean approval in writing by the Commissioner or his/her duly authorized representative.

2. MATERIALS 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 deg. F	ASTM D 1525
Brittleness temp.	Below-200 deg. 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) 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 ½" pipe fittings and brackets.
- (c) 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 the VTCSH standards for color (chromaticity) and brightness (luminance). During the required operating life of LED signal units, the luminance output of the units must not be less than 60 percent (.60) of the values specified in the standard.
 - (c) Unit power supply must be constant current regulated and filtered to provide instant on indications, and to prevent momentary signal outages or flicker.
 - (d) Units must consist of LEDs uniformly distributed to present a homogeneous appearance on the face of the lens from a wide viewing angle.
 - (e) LEDs 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 the traffic signal controller equipment currently in use by the City of Chicago, and meeting the City's latest specifications for traffic signal control equipment. In particular the LED unit must be compatible with the NEMA TS-1 and later traffic signal load switches and conflict monitors.
- (m) Units must meet applicable sections of Title 47, SubPart B, Section 15 of the Federal Communications Commission (FCC) rules as applies to electronic noise limitation and electromagnetic interference.
- (n) Total harmonic distortion (THD) induced into the voltage and current AC power line sine waves must not exceed 20 percent.
- (o) Burn-In. LED Optical units must be energized for a minimum 24 hour burn-in at 100% on-time duty cycle.

2.3.2 Symbolic Messages. 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 ½") 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 PTC SI.

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, thermo-plastic insulation meeting MIL-W-76A specifications. The ends of the lamp leads must be stripped of one-half inch (½") 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.
- 2.8 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.
- 2.9 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, and the pertinent contract number.

3. TESTING AND DOCUMENTATION REQUIREMENTS

- 3.1 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.
- 3.2 Inspection. The signals must be subject to inspection at the discretion of the Commissioner. Final inspection must be made at point of delivery. Any signal rejected must be removed and disposed of by the contractor at his sole cost.
- 3.3 Warranty. The contractor 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 first three (3) years of the warranty, the Contractor must repair or replace such defects and failures at no expense to the City and reimburse the City for any labor costs associated with replacing defective units. In the event defects or failures in the LED units occur during the last four (4) years of the warranty period, the contractor must repair and/or replace all defective materials at no expense to the City. This warranty must be evidenced by a letter or certificate of warranty submitted to the City at the time final delivery is made. The warranty must cover all units delivered in an order or installed by contract, and must include 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.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1495
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
MARCH 20, 2000**

**TRAFFIC SIGNAL MOUNTING BRACKET
POLYCARBONATE, SIDE OF POLE**

1. GENERAL REQUIREMENTS

- 1.1 This specification states the requirements for polycarbonate brackets designed for mounting 12 inch traffic and pedestrian signal heads from side of poles.
- 1.2 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 fourteen (14) working days upon request of the Commissioner. 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)

- 1.4 Definitions. Where referenced in the specification, the following definitions will apply:
- 1.4.1 Approval. Approval will mean approval in writing by the Commissioner or his/her duly authorized representative.

2. MATERIALS AND EQUIPMENT REQUIREMENTS

- 2.1 The bracket must be one piece, ultra violet stabilized polycarbonate resin of the specified color, injection molded complete with integral top, bottom, and sides.
- (a) 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 deg. F	ASTM D 1525
Brittleness temp.	Below-200 deg. 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) Glass. The polycarbonate must be glass impregnated between 30% and 40% to increase strength.
- 2.2 Positioning Device. 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.
- 2.3 Hardware. 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.
- 2.4 Dimensions. The bracket must have nominal dimensions of 12 inches long, by 6 inches high, by 3 inches wide, plus or minus 1/4 inch.
- 2.5 Wiring Space. The bracket must have an integral molded wireway with a minimum 1-1/2 inch diameter opening suitable for installation of multi-conductor cables.
- 2.6 Design Strength. The bracket must be designed to support a 12 inch, single face, five-section, polycarbonate signal head with a 100 mile-per-hour wind
- 2.7 Packing. Each bracket must be packed in a suitable carton so secured that the bracket will not be damaged during shipment, handling, or storage.
- 2.8 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, and the pertinent contract number.

3. TESTING AND DOCUMENTATION REQUIREMENTS

- 3.1 Documentation. The contractor must provide certified manufacturing and testing documentation to demonstrate that the brackets being supplied meet or exceed the specification requirements.
- 3.2 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.
- 3.3 Warranty. The contractor 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 Contractor 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.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1496
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
JUNE 1, 2000**

**TRAFFIC SIGNAL: OPTICALLY PROGRAMMED, TWELVE-INCH
SINGLE FACE, SINGLE OR MULTIPLE-SECTION**

1. GENERAL REQUIREMENTS

- 1.1 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.
- 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 fourteen (14) working days upon request of the Commissioner. 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 Definitions. Where referenced in the specification, the following definitions will apply:
- 1.4.1 Approval. Approval will mean approval in writing by the Commissioner or his/her duly authorized representative.

2. MATERIALS AND EQUIPMENT REQUIREMENTS

- 2.1 The traffic signal heads must conform to ITE Standard "Vehicle Traffic Control Signal Heads" (VTCSH), in which the most recently published revisions will govern.
- 2.2 Housing. The housing of each section must be one piece, cast aluminum, complete with integral top, bottom, and sides.
- (a) 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 PROPOSAL 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) 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.

2.3 The traffic signal heads must be provided with incandescent optical units capable of providing a selectively visible or veiled projected indication anywhere within 15 degrees of the signal optical axis.

2.3.1 OPTICAL UNITS

- (a) Optical System. The optical system will consist of incandescent lamp, 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.
- (b) Lamp. The lamp must be a nominal 150 watt, 3 prong, sealed beam, PAR type unit having an integral reflector, and an average rated life of not less than 6,000 hours.
- (c) 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.

- (d) 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.
- (e) 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.
- (f) Photo Control. The photo control must comprise an integrated, directional light sensing and regulating device interposed between lamp and line wires. The lamp intensity must not be less than 97 percent of uncontrolled intensity at 1,000 foot-candles and must be reduced to 15 ± 2 percent of maximum at less than 1 foot-candle. The response must be proportional and essentially instantaneous to any detectable increase of illumination from darkness to 1,000 foot-candles and damped for any increase from 1,000 foot-candles. The photo control must be compatible with 60-hertz input and responsive within the range of 95 to 130 volts at a temperature range of -40 to 165 degrees F. The nominal open circuit impedance of the photo control unit must be 1000 ohms minimum.

2.4 Wiring. 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 (1/2") 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-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.

- 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 a 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 dust-proof, moisture-proof and weatherproof assembly of the housing and optical system, approved type gaskets of neoprene or silicone rubber must be provided.

3. TESTING AND DOCUMENTATION REQUIREMENTS

- 3.1 Documentation. The contractor must provide certified manufacturing and testing documentation to demonstrate that the traffic signals being supplied meet or exceed the specification requirements.
- 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.
- 3.3 Warranty. The contractor 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 the event defects and failures become apparent during this period, the Contractor 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.

4. PACKAGING

- 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, OPTICALLY PROGRAMMED", the number of Sections as required, the colors, the name of the manufacturer, the pertinent Contract Number and the appropriate City Commodity Code Number.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1518
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
APRIL 17, 2001**

INTERNALLY ILLUMINATED SIGN

SUBJECT

1. This specification states the requirements for an internally illuminated sign. The sign legend will read "NO LEFT TURN", "NO RIGHT TURN", "NO TURNS", or "DO NOT ENTER", or as required. The sign will be legible at all times or will be a blank out type sign which must only be legible when illuminated.

GENERAL

2. (a) Specifications. The illuminated sign must conform in detail to the requirements herein stated, to the specifications of the MUTCD, and to Article 1085.56 of the Standard Specifications.
- (b) Acceptance. Illuminated signs not conforming to this specification will not be accepted.
- (c) Warranty. The contractor must warrant the signs against defective design, material, and workmanship for a period of one (1) year from date of acceptance. In the event of defects or failure during this period, the contractor must repair or replace such defects or failures at no expense to the City. This warranty must be evidenced by a letter or certificate of warranty submitted to the City at the time of final delivery.
- (d) Bidders Drawings. Bidders must submit with their bids detailed scale drawings of the illuminated sign proposed to be used. The drawings must show every dimension necessary to indicate how parts will fit each other and be properly held in assembly.
- (e) Sample. One complete illuminated sign assembly of the manufacture intended to be furnished must be submitted within fourteen (14) business days upon request of the Purchasing Agent.

DETAIL REQUIREMENTS

3. (a) Housing. The case must be formed from 3003H14 sheet aluminum at least .1 inch thick with 2 inch corner radii. The painting must be done in accordance with Section 851 of the Standard Specifications. The case must be primed inside and out with one coat of zinc primer. The inside must be white enamel. The outside must be painted with two coats of baked on enamel of a matte black finish. The case will be furnished with 1 ½" hubs, top and bottom. All nuts and bolts are to be 18-8 stainless steel.

- (b) **Sign Face.** The sign face must be fabricated of material meeting the requirements of Article 1085.56 of the Standard Specifications. The face must be held in place by a formed aluminum channel. The message must read "NO LEFT TURN", "NO RIGHT TURN", "NO TURNS", "DO NOT ENTER", or other message as required by the Commissioner. The message must meet the requirements of the MUTCD. Each sign face must be 24" wide by 30" long.
- (c) **Illumination.** The sign must be illuminated by 8 incandescent lamps of 25 watts each for the non-fiber optic signs. Fiber optic signs must be illuminated by a minimum of two 42 watt lamps, so wired so that if one lamp burns out the sign will still be legible. Fiber optic signs must be meet the requirements of Article 1085.56 of the Standard Specifications.
- (d) **Photo-cell.** The sign case must be modified by the installation of a NEMA standard receptacle for a photo-cell on top of the sign case. The photo-cell must meet Material Specification 1471. The socket must be connected using #12 AWG 90 degree Centigrade wire into the line side of the service to provide photoelectric control over all the lamps in the sign.
- (e) **Legibility.** The sign must be legible 24 hours a day or only for specific time periods depending upon the requirements for the internally illuminated sign. Signs that are legible for specific time periods must be switched on and off from the traffic controller.

PACKAGING

- 4. (a) **General.** The signs must be shipped fully assembled and ready for installation. Each assembly must be individually wrapped and boxed so that the assembly is not damaged in shipment.
- (b) **Labeling.** Each box must be labeled in 3/8 inch high letters "ILLUMINATED SIGN" with "BLANK OUT" or "FIBER OPTIC" also in 3/8 inch high letters; the message also should be in 3/8" high letters. The City Commodity Code, contract number, manufacturer, and date of manufacture must be clearly labeled on the box.

THIS SPECIFICATION MUST NOT BE ALTERED

CONTRACTOR'S DAILY WORK SCHEDULE

Description:

The Contractor shall submit a daily work schedule to the Resident Engineer for the purpose of coordinating the Contractor's activities for the next working day. The daily schedule must be submitted by 3:00 pm the day before. This schedule is necessary for the Engineer to schedule inspection, testing and layout checking for the following day.

The schedule shall include the location and type of all work to be performed that day and all material deliveries. It shall identify all concrete pours, the concrete mix design numbers, and estimated number of cubic yards. The placement of bituminous materials shall be identified, including the mix design numbers, location and number of estimated tons to be placed. The Contractor shall identify all locations where survey verification is required and shall give sufficient advance notification to the Engineer so as not to cause delay.

Method of Measurement:

This coordination work will not be measured for payment.

Basis of Payment:

Preparation and submittal of the Contractor's Daily Work Schedule shall not be paid for separately, but shall be included in the cost of the contract items of work.

REMOVE EXISTING STREET LIGHTING UNIT FOUNDATION

Description. This item consists of removing a concrete foundation for a street lighting unit completely to a level three feet below the grade, disposing of the debris off-site in an approved manner, backfilling the excavation with screenings or other approved backfill material, and reconstruction of the surface area. If the foundation is in a parkway, the parkway shall be properly restored with dirt to the existing level. If the foundation is in sidewalk, the sidewalk shall be restored under a separate pay item and shall not be considered part of this work.

General Requirements. Perform work in accordance with Section 801 of the Standard Specifications, the Bureau of Electricity Standards, and the City of Chicago Electrical Code, except as herein modified.

Removal. Removal must be in accordance with Article 842.05 of the Standard Specifications, except for the last three paragraphs, which are revised to read as follows:

"All concrete reinforcement around embedded poles must be removed. Removal must extend deeper than 24 inches, where required to remove the existing pole intact, at no additional cost. Raised foundations must be removed at no additional cost.

Method of Measurement. Each concrete foundation that is broken down, removed from the site, and the excavation backfilled as specified herein will be counted as a unit for payment.

Basis of Payment. This work will be paid for at the contract unit price per each for REMOVE EXISTING STREET LIGHTING UNIT FOUNDATION, which will be payment in full for the material and work described herein.

(CTE – 11/22/2004)

CONCRETE ADMIXTURES (BDE)

Effective: January 1, 2003

Revised: July 1, 2004

Revise Article 1020.05(b) of the Standard Specifications to read:

“(b) Admixtures. Except as specified, the use of admixtures to increase the workability or to accelerate the hardening of the concrete will be permitted only when approved in writing by the Engineer. The Department will maintain an Approved List of Concrete Admixtures. When the Department permits the use of a calcium chloride accelerator, it shall be according to Article 442.02, Note 5.

When the atmosphere or concrete temperature is 18 °C (65 °F) or higher, a retarding admixture meeting the requirements of Article 1021.03 shall be used in the Class BD Concrete and portland cement concrete bridge deck overlays. The amount of retarding admixture to be used will be determined by the Engineer. 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 Class BD Concrete. The amount of high range water-reducing admixture will be determined by the Engineer. At the option of the Contractor, a water-reducing admixture may be used. Type I cement shall be used.

For Class PC and PS Concrete, a retarding admixture may be added to the concrete mixture when the concrete temperature is 18 °C (65 °F) or higher. Other admixtures may be used when approved by the Engineer, or if specified by the contract. If an accelerating admixture is permitted by the Engineer, it shall be the non-chloride type.

At the Contractor’s option, admixtures in addition to an air-entraining admixture may be used for Class PP-1 concrete. The accelerator shall be the non-chloride type. If a water-reducing or retarding admixture is used, the cement factor may be reduced a maximum 18 kg/cu m (0.30 hundredweight/cu yd). If a high range water-reducing admixture is used, the cement factor may be reduced a maximum 36 kg/cu m (0.60 hundredweight/cu yd). Cement factor reductions shall not be cumulative when using multiple admixtures. An accelerator shall always be added prior to a high range water-reducing admixture, if both are used.

If Class C fly ash or ground granulated blast-furnace slag is used in Class PP-1 concrete, a water-reducing or high range water-reducing admixture shall be used. However, the cement factor shall not be reduced if a water-reducing, retarding, or high range water-reducing admixture is used. In addition, an accelerator shall not be used.

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. For Class PP-3 concrete, the non-chloride accelerator shall be calcium nitrite.

For Class PP-2 or PP-3 concrete, the Contractor has the option to use a water-reducing admixture. A retarding admixture shall not be used unless approved by the Engineer. A water-reducing, retarding, or high range water-reducing admixture shall not be used to reduce the cement factor.

When the air temperature is less than 13 °C (55 °F) for Class PP-1 or PP-2 concrete, the non-chloride accelerator shall be calcium nitrite.

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. 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 according to Article 1103.04, but a retarding admixture shall not be used unless approved by the Engineer. A water-reducing, retarding, or high range water-reducing admixture shall not be used to reduce the cement factor.

If the Department specifies a calcium chloride accelerator for Class PP-1 concrete, the maximum chloride dosage shall be 1.0 L (1.0 quart) of solution per 45 kg (100 lb) of cement. The dosage may be increased to a maximum 2.0 L (2.0 quarts) per 45 kg (100 lb) of cement if approved by the Engineer. If the Department specifies a calcium chloride accelerator for Class PP-2 concrete, the maximum chloride dosage shall be 1.3 L (1.3 quarts) of solution per 45 kg (100 lb) of cement. The dosage may be increased to a maximum 2.6 L (2.6 quarts) per 45 kg (100 lb) of cement if approved by the Engineer.

For Class PV, MS, SI, RR, SC and SH concrete, at the option of the Contractor, or when specified by the Engineer, a water-reducing admixture or a retarding admixture may be used. The amount of water-reducing admixture or retarding admixture permitted will be determined by the Engineer. The air-entraining admixture and other admixtures shall be added to the concrete separately, and shall be permitted to intermingle only after they have separately entered the concrete batch. The sequence, method and equipment for adding the admixtures shall be approved by the Engineer. The water-reducing admixture shall not delay the initial set of the concrete by more than one hour. Type I cement shall be used.

When a water-reducing admixture is added, a cement factor reduction of up to 18 kg/cu m (0.30 hundredweight/cu yd), from the concrete designed for a specific slump without the admixture, will be permitted for Class PV, MS, SI, RR, SC and SH concrete. When an approved high range water-reducing admixture is used, a cement factor reduction of up to 36 kg/cu m (0.60 hundredweight/cu yd), from a specific water cement/ratio without the admixture, will be permitted based on a 14 percent minimum water reduction. This is applicable to Class PV, MS, SI, RR, SC and SH concrete. A cement factor below 320 kg/cu m (5.35 hundredweight/cu yd) will not be permitted for Class PV, MS, SI, RR, SC and SH concrete. A cement factor reduction will not be allowed for concrete placed underwater. Cement factor reductions shall not be cumulative when using multiple admixtures.

For use of admixtures to control concrete temperature, refer to Articles 1020.14(a) and 1020.14(b).

The maximum slumps given in Table 1 may be increased to 175 mm (7 in.) when a high range water-reducing admixture is used for all classes of concrete except Class PV and PP.”

Revise Section 1021 of the Standard Specifications to read:

“SECTION 1021. CONCRETE ADMIXTURES”

1021.01 General. Admixtures shall be furnished in liquid form ready for use. The admixtures may be delivered in the manufacturer's original containers, bulk tank trucks or such containers or tanks as are acceptable to the Engineer. Delivery shall be accompanied by a ticket which clearly identifies the manufacturer and trade name of the material. Containers shall be readily identifiable to the satisfaction of the Engineer as to manufacturer and trade name of the material they contain.

Prior to inclusion of a product on the Department's Approved List of Concrete Admixtures, the manufacturer shall submit a report prepared by an independent laboratory accredited by the AASHTO Accreditation Program. The report shall show the results of physical tests conducted no more than five years prior to the time of submittal, according to applicable specifications.

Tests shall be conducted using materials and methods specified on a "test" concrete and a "reference" concrete, together with a certification that no changes have been made in the formulation of the material since the performance of the tests. Per the manufacturer's option, the cement content for all required tests shall either be according to applicable specifications or 335 kg/cu m (5.65 cwt/cu yd). Compressive strength test results for six months and one year will not be required.

In addition to the report, the manufacturer shall submit AASHTO T 197 water content and set time test results on the standard cement used by the Department. The test and reference concrete mixture shall contain a cement content of 335 kg/cu m (5.65 cwt/cu yd). The manufacturer may select their lab or an independent lab to perform this testing. The laboratory is not required to be accredited by the AASHTO Accreditation Program.

Prior to the approval of an admixture, the Engineer may conduct all or part of the applicable tests on a sample that is representative of the material to be furnished. The test and reference concrete mixtures tested by the Engineer will contain a cement content of 335 kg/cu m (5.65 cwt/cu yd). For freeze-thaw testing, the Department will perform the test according to Illinois Modified AASHTO T 161, Procedure B.

The manufacturer shall include in the submittal the following information according to ASTM C 494; the average and manufacturing range of specific gravity, the average and manufacturing range of solids in the solution, and the average and manufacturing range of pH. The submittal shall also include an infrared spectrophotometer trace no more than five years old.

When test results are more than seven years old, the manufacturer shall re-submit the infrared spectrophotometer trace and the report prepared by an independent laboratory accredited by the AASHTO Accreditation Program.

All admixtures, except chloride-based accelerators, shall contain no more than 0.3 percent chloride by mass (weight).

1021.02 Air-Entraining Admixtures. Air-entraining admixtures shall conform to the requirements of AASHTO M 154.

If the manufacturer certifies that the air-entraining admixture is an aqueous solution of Vinsol resin that has been neutralized with sodium hydroxide (caustic soda), testing for compliance with the requirements may be waived by the Engineer. In the certification, the manufacturer shall show complete information with respect to the formulation of the solution, including the number of parts of Vinsol resin to each part of sodium hydroxide. Before the approval of its use is granted, the Engineer will test the solution for its air-entraining quality in comparison with a solution prepared and kept for that purpose.

1021.03 Retarding and Water-Reducing Admixtures. The admixture shall comply with the following requirements:

- (a) The retarding admixture shall comply with the requirements of AASHTO M 194, Type B (retarding) or Type D (water-reducing and retarding).
- (b) The water-reducing admixture shall comply with the requirements of AASHTO M 194, Type A.
- (c) The high range water-reducing admixture shall comply with the requirements of AASHTO M 194, Type F (high range water-reducing) or Type G (high range water-reducing and retarding).

When a Type F or Type G high range water-reducing admixture is used, water-cement ratios shall be a minimum of 0.32.

Type F or Type G admixtures may be used, subject to the following restrictions:

For Class MS, SI, RR, SC and SH concrete, the water-cement ratio shall be a maximum of 0.44.

The Type F or Type G admixture shall be added at the jobsite unless otherwise directed by the Engineer. The initial slump shall be a minimum of 40 mm (1 1/2 in.) prior to addition of the Type F or Type G admixture, except as approved by the Engineer.

When a Type F or Type G admixture is used, retempering with water or with a Type G admixture will not be allowed. An additional dosage of a Type F admixture, not to exceed 40 percent of the original dosage, may be used to retemper concrete once, provided set time is not unduly affected. A second retempering with a Type F admixture may be used for all classes of concrete except Class PP and SC, provided that the dosage does not exceed the dosage used for the first retempering, and provided that the set time is not unduly affected. No further retempering will be allowed.

Air tests shall be performed after the addition of the Type F or Type G admixture.

1021.04 Set Accelerating Admixtures. The admixture shall comply with the requirements of AASHTO M 194, Type C (accelerating) or Type E (water reducing and accelerating)”

DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION (BDE)

Effective: September 1, 2000

Revised: June 1, 2004

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. 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. 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 DBE Directory or most recent addendum.

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 federally-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate.

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 firms 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. This 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 20.00% 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 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 forth in this Special Provision:

- (a) The bidder documents that firmly committed 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 may consult the DBE Directory as a reference source for DBE companies certified by the Department. 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 web site at www.dot.state.il.us.

BIDDING PROCEDURES. Compliance with the bidding procedures of this Special Provision is required prior to the award of the contract and the failure of the as-read low bidder to comply will render the bid nonresponsive.

- (a) In order to assure the timely award of the contract, the as-read low bidder must submit a Disadvantaged Business Utilization Plan on Department form SBE 2026 within seven (7) working days after the date of letting. To meet the seven (7) day requirement, the bidder may send the Plan by certified mail or delivery service within the seven (7) working day period. If a question arises concerning the mailing date of a Plan, the mailing date will be established by the U.S. Postal Service postmark on the original certified mail receipt from the U.S. Postal Service or the receipt issued by a delivery service. It is the responsibility of the as-read low bidder to ensure that the postmark or receipt date is affixed within the seven (7) working days if the bidder intends to rely upon mailing or delivery to satisfy the submission day requirement. The Plan is to be submitted 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). It is the responsibility of the bidder to obtain confirmation of telefax delivery. The Department will not accept a Utilization Plan if it does not meet the seven (7) day submittal requirement, and the bid will be declared nonresponsive. In the event the bid is declared nonresponsive due to a failure to submit a Plan or failure to comply with the bidding procedures set forth herein, the Department may elect to cause the forfeiture of the penal sum of the bidder's proposal guaranty, and may deny authorization to bid the project if re-advertised for bids. The Department reserves the right to invite any other bidder to submit a Utilization Plan at any time for award consideration or to extend the time for award.
- (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. The signatures on these forms must be original signatures. All elements of information indicated on the said form shall be provided, including but not limited to the following:
 - (1) The name and address of each DBE to be used;
 - (2) A description, including pay item numbers, of the commercially useful work to be done by each DBE;

- (3) The price to be paid to each DBE for the identified work specifically stating 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) A commitment statement signed by the bidder and each DBE evidencing availability and intent to perform commercially useful work on the project; and
 - (5) If the bidder is a joint venture comprised of DBE firms and non-DBE firms, the plan must also include a clear identification of the portion of the work to be performed by the DBE partner(s).
- (d) The contract will not be awarded until the Utilization Plan submitted by the bidder is approved. The Utilization Plan will be approved by the Department if the Plan commits sufficient commercially useful DBE work performance to meet the contract goal. The Utilization Plan will not be approved by the Department if the Plan does not commit sufficient DBE performance to meet the contract goal unless the bidder documents that it made a good faith effort to meet the goal. The good faith procedures of Section VIII of this special provision apply. If the Utilization Plan is not approved because it is deficient in a technical matter, unless waived by the Department, the bidder will be notified and will be allowed no less than a five (5) working day period in order to cure the deficiency.

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% 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 firm does not count toward the DBE goals.
- (b) DBE as a joint venture Contractor: 100% 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% 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 firm does not count toward the DBE goal.

- (d) DBE as a trucker: 100% 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 full value of all such DBE trucks operated using DBE employed drivers. Goal credit will be limited to the value of the reasonable fee or commission received by the DBE if trucks are leased from a non-DBE company.
- (e) DBE as a material supplier:
 - (1) 60% goal credit for the cost of the materials or supplies purchased from a DBE regular dealer.
 - (2) 100% goal credit for the cost of materials or supplies obtained from a DBE manufacturer.
 - (3) 100% credit for the value of reasonable fees and commissions for the procurement of materials and supplies if not a regular dealer or manufacturer.

GOOD FAITH EFFORT PROCEDURES. If the bidder cannot obtain sufficient DBE commitments to meet the contract goal, the bidder must document in the Utilization Plan the good faith efforts made in the attempt 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 could reasonably be expected to obtain sufficient DBE participation. The Department will consider the quality, quantity and intensity of the kinds of efforts that the bidder has made. Mere *pro forma* efforts are not good faith efforts; rather, the bidder is expected to have taken those 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 prime contractor to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Prime contractors 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 contractor'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 contractor'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 Contractor 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 a good faith effort has not been made, the Department will notify the bidder of that preliminary determination by contacting the responsible company official designated in the Utilization Plan. The preliminary determination shall include a statement of reasons why good faith efforts have not been found, and may include additional good faith efforts that the bidder could take. The notification will designate a five (5) working day period during which the bidder shall take additional efforts. The bidder is not limited by a statement of additional efforts, but may take other action beyond any stated additional efforts in order to obtain additional DBE commitments. The bidder shall submit an amended Utilization Plan if additional DBE commitments to meet the contract goal are secured. If additional DBE commitments sufficient to meet the contract goal are not secured, the bidder shall report the final good faith efforts made in the time allotted. All additional efforts taken by the bidder will be considered as part of the bidder's good faith efforts. If the bidder is not able to meet the goal after taking additional efforts, the Department will make a pre-final determination of the good faith efforts of the bidder and will notify the designated responsible company official of the reasons for an adverse determination.
- (c) The bidder may request administrative reconsideration of a pre-final determination adverse to the bidder within the five (5) working days after 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 pre-final determination shall become final if a request is not made and delivered. A request may provide additional written documentation and/or argument concerning the issue of whether an adequate good faith effort was made to meet the contract goal. In addition, the request shall be considered a consent by the bidder to extend the time for award. 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 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 (10) working days after receipt of the request for reconsideration, explaining the basis for finding that the bidder did or did not meet the goal or make adequate good faith efforts to do so. A final decision by the Reconsideration Officer that a good faith effort was made shall approve the Utilization Plan submitted by the bidder and shall clear the contract for award. A final decision that a good faith effort was not made shall render the bid nonresponsive.

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 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.

- (a) 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) All work indicated for performance by an approved DBE shall be performed, managed and supervised by the DBE executing the Participation Statement. The Contractor shall not terminate for convenience a DBE listed in the Utilization Plan and then perform the work of the terminated DBE with its own forces, those of an affiliate or those of another subcontractor, whether DBE or not, without first obtaining the written consent of the Bureau of Small Business Enterprises to amend the Utilization Plan. If a DBE listed in the Utilization Plan is terminated for reasons other than convenience, or fails to complete its work on the contract for any reason, the Contractor shall make good faith efforts to find another DBE to substitute for the terminated DBE. The good faith efforts shall be directed at finding another DBE to perform at least the same amount of work under the contract as the DBE that was terminated, but only to the extent needed to meet the contract goal or the amended contract goal. The Contractor shall notify the Bureau of Small Business Enterprises of any termination for reasons other than convenience, and shall obtain approval for inclusion of the substitute DBE in the Utilization Plan. If good faith efforts following a termination of a DBE for cause are not successful, the Contractor shall contact the Bureau and provide a full accounting of the efforts undertaken to obtain substitute DBE participation. The Bureau will evaluate the good faith efforts in light of all circumstances surrounding the performance status of the contract, and determine whether the contract goal should be amended.
- (c) 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 therefor to the DBE by the Contractor, but not later than thirty (30) calendar days after payment has been made by the Department to the Contractor for such work or material, the Contractor shall submit a DBE Payment Report on Department form SBE 2115 to the District Engineer. If full and final payment has not been made to the DBE, the Report 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 Plan, the Department will deduct from contract payments to the Contractor the amount of the goal not achieved as liquidated and ascertained damages.
- (d) 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.

FLAGGER VESTS (BDE)

Effective: April 1, 2003

Revise the first sentence of Article 701.04(c)(1) of the Standard Specifications to read:

“The flagger shall be stationed to the satisfaction of the Engineer and be equipped with a fluorescent orange, fluorescent yellow/green or a combination of fluorescent orange and fluorescent yellow/green vest meeting the requirements of the American National Standards Institute specification ANSI/ISEA 107-1999 for Conspicuity Class 2 garments and approved flagger traffic control signs conforming to Standard 702001 and Article 702.05(e).”

Revise Article 701.04(c)(6) of the Standard Specifications to read:

“(6) Nighttime Flagging. The flagger station shall be lit by additional overhead lighting other than streetlights. The flagger shall be equipped with a fluorescent orange or fluorescent orange and fluorescent yellow/green garment meeting the requirements of the American National Standards Institute specification ANSI/ISEA 107-1999 for Conspicuity Class 2 garments.”

80101

MINIMUM LANE WIDTH WITH LANE CLOSURE (BDE)

Effective: January 1, 2005

Add the following paragraph after the eighth paragraph of Article 701.04(a) of the Standard Specifications.

“The minimum lane width adjacent to a closed lane during paving, patching, and other moving operations on freeways and expressways shall be a minimum of 3 m (10 ft). The 3 m (10 ft) shall be clear, unobstructed, and free of channelizing devices or other obstacles.”

80137

PARTIAL PAYMENTS (BDE)

Effective: September 1, 2003

Revise Article 109.07 of the Standard Specifications to read:

“**109.07 Partial Payments.** Partial payments will be made as follows:

- (a) Progress Payments. At least once each month, the Engineer will make a written estimate of the amount of work performed in accordance with the contract, and the value thereof at the contract unit prices. The amount of the estimate approved as due for payment will be vouchered by the Department and presented to the State Comptroller for payment. No amount less than \$1000.00 will be approved for payment other than the final payment.

The failure to perform any requirement, obligation, or term of the contract by the Contractor shall be reason for withholding any progress payments until the Department determines that compliance has been achieved. Furthermore, progress payments may be reduced by liens filed pursuant to Section 23(c) of the Mechanics Lien Act, 770 ILCS 60/23(c).

- (b) **Material Allowances.** At the discretion of the Department, payment may be made for materials, prior to their use in the work, when satisfactory evidence is presented by the Contractor. Satisfactory evidence includes justification for the allowance (to expedite the work, meet project schedules, regional or national material shortages, etc.), documentation of material and transportation costs, and evidence that such material is properly stored on the project or at a secure location acceptable and accessible to the Department.

Material allowances will be considered only for nonperishable materials when the cost, including transportation, exceeds \$10,000 and such materials are not expected to be utilized within 60 days of the request for the allowance. For contracts valued under \$500,000, the minimum \$10,000 requirement may be met by combining the principal (material) product of no more than two contract items. An exception to this two item limitation may be considered for any contract regardless of value for items in which material (products) are similar except for type and/or size.

Material allowances shall not exceed the value of the contract items in which used and shall not include the cost of installation or related markups. Amounts paid by the Department for material allowances will be deducted from estimates due the Contractor as the material is used. Two-sided copies of the Contractor's cancelled checks for materials and transportation must be furnished to the Department within 60 days of payment of the allowances or the amounts will be reclaimed by the Department."

80116

PAYMENTS TO SUBCONTRACTORS (BDE)

Effective: June 1, 2000

Revised: September 1, 2003

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 no later than 30 days from the receipt of each payment made to the Contractor.

State law addresses the timing of payments to be made to subcontractors. Section 7 of the Prompt Payment Act, 30 ILCS 540/7, generally requires that when a Contractor receives any payment from the Department, the Contractor is required to make corresponding, proportional payments to each subcontractor performing work within 15 calendar days after receipt of the state payment. Section 7 of the State Prompt Payment Act further provides that interest in the amount of 2% per month, in addition to the payment due, shall be paid to any subcontractor 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 throughout the contracting chain.

This Special Provision establishes the required federal contract clause, and adopts the 15 calendar day requirement of the Act for purposes of compliance with the federal regulation regarding payments to subcontractors. This contract is subject to the following payment obligations.

As progress payments are made to the Contractor in accordance with Article 109.07 of the Standard Specifications for Road and Bridge Construction, the Contractor shall make a corresponding partial payment within 15 calendar days to each subcontractor in proportion to the work satisfactorily completed by each subcontractor. The proportionate amount of partial payment due to each subcontractor 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 shall be paid in full within 15 calendar days after the subcontractor's work has been satisfactorily completed. The Contractor shall hold no retainage from the subcontractors.

This Special Provision does not create any rights in favor of any subcontractor against the State of Illinois or authorize any cause of action against the State of Illinois on account of any payment, nonpayment, delayed payment or interest claimed by application of the State Prompt Payment Act. The Department will neither determine the reasonableness of any cause for delay of payment nor enforce any claim to payment, including interest. Moreover, the Department will not approve any delay or postponement of the 15 day requirement. State law creates 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 in accordance with the Public Construction Bond Act, 30 ILCS 550.

80022

PERSONAL PROTECTIVE EQUIPMENT (BDE)

Effective: July 1, 2004

All personnel, excluding flaggers, working outside of a vehicle (car or truck) within 7.6 m (25 ft) of pavement open to traffic shall wear a fluorescent orange, fluorescent yellow/green or a combination of fluorescent orange and fluorescent yellow/green vest meeting the requirements of the American National Standards Institute specification ANSI/ISEA 107-1999 for Conspicuity Class 2 garments. Other types of garments may be substituted for the vest as long as the garments have manufacturers tags identifying them as meeting the ANSI Class 2 requirement.

80130

PORTABLE CHANGEABLE MESSAGE SIGNS (BDE)

Effective: November 1, 1993

Revised: April 2, 2004

Description. This work shall consist of furnishing, placing, and maintaining changeable message sign(s) at the locations(s) shown on the plans or as directed by the Engineer.

The sign(s) shall be trailer mounted. The message panel shall be at least 2.1 m (7 ft) above the pavement, present a level appearance, and be capable of displaying up to eight characters in each of three lines at a time. Character height shall be 450 mm (18 in.).

The message panel shall be of either a bulb matrix or disc matrix design controlled by an onboard computer capable of storing a minimum of 99 programmed messages for instant recall. The computer shall be capable of being programmed to accept messages created by the operator via an alpha-numeric keyboard and able to flash any six messages in sequence. The message panel shall also be capable of being controlled by a computer from a remote location via a cellular linkage. The Contractor shall supply the modem, the cellular phone, and the necessary software to run the sign from a remote computer at a location designated by the Engineer. The Contractor shall promptly program and/or reprogram the computer to provide the messages as directed by the Engineer.

The message panel shall be visible from 400 m (1/4 mile) under both day and night conditions. The letters shall be legible from 250 m (750 ft).

The sign shall include automatic dimming for nighttime operation and a power supply capable of providing 24 hours of uninterrupted service.

The Contractor shall provide all preventive maintenance efforts s(he) deems necessary to achieve uninterrupted service. If service is interrupted for any cause and not restored within 24 hours, the Engineer will cause such work to be performed as may be necessary to provide this service. The cost of such work shall be borne by the Contractor or deducted from current or future compensation due the Contractor.

When the sign(s) are displaying messages, they shall be considered a traffic control device. At all times when no message is displayed, they shall be considered equipment.

Basis of Payment. When portable changeable message signs are shown on the Standard, this work will not be paid for separately but shall be considered as included in the cost of the Standard.

For all other portable changeable message signs, this work will be paid for at the contract unit price per calendar month for each sign as CHANGEABLE MESSAGE SIGN.

80124

PORTLAND CEMENT (BDE)

Effective: January 1, 2005

Replace the first sentence of the second paragraph of Article 1001.01 of the Standard Specifications with the following:

“For portland cement according to ASTM C 150, the addition of up to 5.0 percent limestone by mass (weight) to the cement will not be permitted. Also, the total of all organic processing additions shall not exceed 1.0 percent by mass (weight) of the cement and the total of all inorganic processing additions shall not exceed 4.0 percent by mass (weight) of the cement.”

80139

PORTLAND CEMENT CONCRETE (BDE)

Effective: November 1, 2002

Add the following paragraph after the fourth paragraph of Article 1103.01(b) of the Standard Specifications:

“The truck mixer shall be approved before use according to the Bureau of Materials and Physical Research’s Policy Memorandum, “Approval of Concrete Plants and Delivery Trucks”.”

Add the following paragraph after the first paragraph of Article 1103.01(c) of the Standard Specifications:

“The truck agitator shall be approved before use according to the Bureau of Materials and Physical Research’s Policy Memorandum, “Approval of Concrete Plants and Delivery Trucks”.”

Add the following paragraph after the first paragraph of Article 1103.01(d) of the Standard Specifications:

“The nonagitator truck shall be approved before use according to the Bureau of Materials and Physical Research’s Policy Memorandum, “Approval of Concrete Plants and Delivery Trucks”.”

Revise the first sentence of the first paragraph of Article 1103.02 of the Standard Specifications to read:

“The plant shall be approved before production begins according to the Bureau of Materials and Physical Research’s Policy Memorandum, “Approval of Concrete Plants and Delivery Trucks”.”
80083

TRAFFIC CONTROL DEFICIENCY DEDUCTION (BDE)

Effective: April 1, 1992

Revised: January 1, 2005

To ensure a prompt response to incidents involving the integrity of work zone traffic control, the Contractor shall provide a telephone number where a responsible individual can be contacted 24 hours-a-day.

When the Engineer is notified, or determines a traffic control deficiency exists, he/she will notify and direct the Contractor to correct the deficiency within a specified time. The specified time, which begins upon notification to the Contractor, will be from 1/2 hour to 12 hours based upon the urgency of the situation and the nature of the deficiency. The Engineer shall be the sole judge.

A deficiency may be any lack of repair, maintenance, or non-compliance with the traffic control plan. A deficiency may also be applied to situations where corrective action is not an option such as the use of non-certified flaggers for short term operations; working with lane closures beyond the time allowed in the contract; or failure to perform required contract obligations such as traffic control surveillance.

If the Contractor fails to correct a deficiency within the specified time, a daily monetary deduction will be imposed for each calendar day or fraction thereof the deficiency exists. The calendar day(s) will begin with notification to the Contractor and end with the Engineer's acceptance of the correction. The daily monetary deduction will be either \$1,000 or 0.05 percent of the awarded contract value, whichever is greater. For those deficiencies where corrective action was not an option this monetary deduction will be immediate.

In addition, if the Contractor fails to respond, the Engineer may correct the deficiency and the cost thereof will be deducted from monies due or which may become due the Contractor. This corrective action will in no way relieve the Contractor of his/her contractual requirements or responsibilities.

5729I

TRAFFIC STRUCTURES (BDE)

Effective: November 1, 2002

Add the following sentence to the end of the first paragraph of Article 1069.01(a)(1) of the Standard Specifications:

“Light poles shall be designed for 145 km/hr (90 mph) wind velocity and a minimum design life of 50 years.”

Add the following sentence to the end of the third paragraph of Article 1069.04(a) of the Standard Specifications:

“Light towers shall be designed for 145 km/hr (90 mph) wind velocity and a minimum design life of 50 years.”

Revise the last sentence of the first paragraph of Article 1077.03(a)(1) of the Standard Specifications to read:

“The design shall be according to AASHTO “Standard Specification for Structural Supports for Highway Signs, Luminaries and Traffic Signals” 1994 Edition for 130 km/hr (80 mph) wind velocity. However the arm-to-pole connection shall be according to the “ring plate” detail as shown in Figure 11-1(f) of the 2002 Interim, to the AASHTO “Standard Specification for Structural Supports for Highway Signs, Luminaries and Traffic Signals” 2001 4th Edition.”

80088

TRAFFIC STRUCTURES (BDE)

Effective: November 1, 2002

Add the following sentence to the end of the first paragraph of Article 1069.01(a)(1) of the Standard Specifications:

“Light poles shall be designed for 145 km/hr (90 mph) wind velocity and a minimum design life of 50 years.”

Add the following sentence to the end of the third paragraph of Article 1069.04(a) of the Standard Specifications:

“Light towers shall be designed for 145 km/hr (90 mph) wind velocity and a minimum design life of 50 years.”

Revise the last sentence of the first paragraph of Article 1077.03(a)(1) of the Standard Specifications to read:

“The design shall be according to AASHTO “Standard Specification for Structural Supports for Highway Signs, Luminaries and Traffic Signals” 1994 Edition for 130 km/hr (80 mph) wind velocity. However the arm-to-pole connection shall be according to the “ring plate” detail as shown in Figure 11-1(f) of the 2002 Interim, to the AASHTO “Standard Specification for Structural Supports for Highway Signs, Luminaries and Traffic Signals” 2001 4th Edition.”

| 80088

WORK ZONE TRAFFIC CONTROL DEVICES (BDE)

| Effective: January 1, 2003

Revised: November 1, 2004

Add the following to Article 702.01 of the Standard Specifications:

“All devices and combinations of devices shall meet the requirements of the National Cooperative Highway Research Program (NCHRP) Report 350 for their respective categories. The categories are as follows:

Category 1 includes small, lightweight, channelizing and delineating devices that have been in common use for many years and are known to be crashworthy by crash testing of similar devices or years of demonstrable safe performance. These include cones, tubular markers, flexible delineators and plastic drums with no attachments. Category 1 devices shall be crash tested and accepted or may be self-certified by the manufacturer.

Category 2 includes devices that are not expected to produce significant vehicular velocity change but may otherwise be hazardous. These include drums and vertical panels with lights, barricades and portable sign supports. Category 2 devices shall be crash tested and accepted for Test Level 3.

Category 3 includes devices that are expected to cause significant velocity changes or other potentially harmful reactions to impacting vehicles. These include crash cushions, truck mounted attenuators and other devices not meeting the definitions of Category 1 or 2. Category 3 devices shall be crash tested and accepted for either Test Level 3 or the test level specified.

Category 4 includes portable or trailer-mounted devices such as arrow boards, changeable message signs, temporary traffic signals and area lighting supports. Currently, there is no implementation date set for this category and it is exempt from the NCHRP 350 compliance requirement.

The Contractor shall provide a manufacturer's self-certification letter for each Category 1 device and an FHWA acceptance letter for each Category 2 and Category 3 device used on the contract. The letters shall state the device meets the NCHRP 350 requirements for its respective category and test level, and shall include a detail drawing of the device."

Delete the third, fourth and fifth paragraphs of Article 702.03(b) of the Standard Specifications.

Delete the third sentence of the first paragraph of Article 702.03(c) of the Standard Specifications.

Revise the first sentence of the first paragraph of Article 702.03(e) of the Standard Specifications to read:

"Drums shall be nonmetallic and have alternating reflectorized Type AA or Type AP fluorescent orange and reflectorized white horizontal, circumferential stripes."

Add the following to Article 702.03 of the Standard Specifications:

"(h) Vertical Barricades. Vertical barricades may be used in lieu of cones, drums or Type II barricades to channelize traffic."

Delete the fourth paragraph of Article 702.05(a) of the Standard Specifications.

Revise the sixth paragraph of Article 702.05(a) of the Standard Specifications to read:

"When the work operations exceed four days, all signs shall be post mounted unless the signs are located on the pavement or define a moving or intermittent operation. When approved by the Engineer, a temporary sign stand may be used to support a sign at 1.2 m (5 ft) minimum where posts are impractical. Longitudinal dimensions shown on the plans for the placement of signs may be increased up to 30 m (100 ft) to avoid obstacles, hazards or to improve sight distance, when approved by the Engineer. "ROAD CONSTRUCTION AHEAD" signs will also be required on side roads located within the limits of the mainline "ROAD CONSTRUCTION AHEAD" signs."

Delete all references to "Type 1A barricades" and "wing barricades" throughout Section 702 of the Standard Specifications.

80097

SUBCONTRACTOR MOBILIZATION PAYMENTS (BDE)

Effective: January 2, 2005

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 in accordance with 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.

This provision shall be incorporated directly or by reference into each subcontract approved by the Department.

80143

STEEL COST ADJUSTMENT (BDE)

Effective: April 2, 2004

Revised: July 1, 2004

Description. At the bidder's option, a steel cost adjustment will be made to provide additional compensation to the Contractor or a credit to the Department for fluctuations in steel prices. The bidder must indicate on the attached form whether or not steel cost adjustments will be part of this contract. This attached form shall be submitted with the bid. Failure to submit the form shall make this contract exempt of steel cost adjustments.

Types of Steel Products. An adjustment will be made for fluctuations in the cost of steel used in the manufacture of the following items:

Metal Piling (excluding temporary sheet piling)
Structural Steel
Reinforcing Steel

Other steel materials such as dowel bars, tie bars, mesh reinforcement, guardrail, steel traffic signal and light poles, towers and mast arms, metal railings (excluding wire fence), frames and grates, and other miscellaneous items will be subject to a steel cost adjustment when the pay item they are used in has a contract value of \$10,000 or greater.

Documentation. Sufficient documentation shall be furnished to the Engineer to verify the following:

- (a) Evidence that increased or decreased steel costs have been passed on to the Contractor.
- (b) The dates and quantity of steel, in kg (lb), shipped from the mill to the fabricator.
- (c) The quantity of steel, in kg (lb), incorporated into the various items of work covered by this special provision. The Department reserves the right to verify submitted quantities.

Method of Adjustment. Steel cost adjustments will be computed as follows:

$$SCA = Q \times D$$

Where: SCA = steel cost adjustment, in dollars
Q = quantity of steel incorporated into the work, in kg (lb)
D = price factor, in dollars per kg (lb)

$$D = CBP_M - CBP_L$$

Where: CBP_M = The average of the Consumer Buying Price indices for Shredded Auto Scrap (Chicago) and No. 1 Heavy Melt (Chicago) as published by the American Metal Market (AMM) for the day the steel is shipped from the mill. The indices will be converted from dollars per ton to dollars per kg (lb).

CBP_L = The average of the Consumer Buying Price indices for Shredded Auto Scrap (Chicago) and No. 1 Heavy Melt (Chicago) as published by the AMM for the day the contract is let. The indices will be converted from dollars per ton to dollars per kg (lb).

The unit masses (weights) of steel that will be used to calculate the steel cost adjustment for the various items are shown in the attached table.

No steel cost adjustment will be made for any products manufactured from steel having a mill shipping date prior to the letting date.

If the Contractor fails to provide the required documentation, the method of adjustment will be calculated as described above; however, the CBP_M will be based on the date the steel arrives at the job site. In this case, an adjustment will only be made when there is a decrease in steel costs.

Basis of Payment. Steel cost adjustments may be positive or negative but will only be made when there is a difference between the CBP_L and CBP_M in excess of five percent, as calculated by:

$$\text{Percent Difference} = \{(CBP_L - CBP_M) \div CBP_L\} \times 100$$

Steel cost adjustments will be calculated by the Engineer and will be paid or deducted when all other contract requirements for the steel items are satisfied. Adjustments will only be made for fluctuations in the cost of the steel as described herein. No adjustment will be made for changes in the cost of manufacturing, fabrication, shipping, storage, etc.

FAI ROUTE 90/94 (DAN RYAN EXPRESSWAY)
SECTION: 2004-099TS
COOK COUNTY

Attachment

Item	Unit Mass (Weight)
Metal Piling (excluding temporary sheet piling)	
Furnishing Metal Pile Shells 305 mm (12 in.), 3.80 mm (0.179 in.) wall thickness)	34 kg/m (23 lb/ft)
Furnishing Metal Pile Shells 305 mm (12 in.), 6.35 mm (0.250 in.) wall thickness)	48 kg/m (32 lb/ft)
Furnishing Metal Pile Shells 356 mm (14 in.), 6.35 mm (0.250 in.) wall thickness)	55 kg/m (37 lb/ft)
Other piling	See plans
Structural Steel	See plans for weights
Reinforcing Steel	See plans for weights
Dowel Bars and Tie Bars	3 kg (6 lb) each
Mesh Reinforcement	310 kg/sq m (63 lb/100 sq ft)
Guardrail	
Steel Plate Beam Guardrail, Type A w/steel posts	30 kg/m (20 lb/ft)
Steel Plate Beam Guardrail, Type B w/steel posts	45 kg/m (30 lb/ft)
Steel Plate Beam Guardrail, Types A and B w/wood posts	12 kg/m (8 lb/ft)
Steel Plate Beam Guardrail, Type 2	140 kg (305 lb) each
Steel Plate Beam Guardrail, Type 6	570 kg (1260 lb) each
Traffic Barrier Terminal, Type 1 Special (Tangent)	330 kg (730 lb) each
Traffic Barrier Terminal, Type 1 Special (Flared)	185 kg (410 lb) each
Steel Traffic Signal and Light Poles, Towers and Mast Arms	
Traffic Signal Post	16 kg/m (11 lb/ft)
Light Pole, Tenon Mount and Twin Mount, 9 m – 12 m (30 - 40 ft)	21 kg/m (14 lb/ft)
Light Pole, Tenon Mount and Twin Mount, 13.5 m – 16.5 m (45 - 55 ft)	31 kg/m (21 lb/ft)
Light Pole w/Mast Arm, 9 m – 15.2 m (30 - 50 ft)	19 kg/m (13 lb/ft)
Light Pole w/Mast Arm, 16.5 m – 18 m (55 - 60 ft)	28 kg/m (19 lb/ft)
Light Tower w/Luminaire Mount, 24 m – 33.5 m (80 - 110 ft)	46 kg/m (31 lb/ft)
Light Tower w/Luminaire Mount, 36.5 m – 42.5 m (120 - 140 ft)	97 kg/m (65 lb/ft)
Light Tower w/Luminaire Mount, 45.5 m – 48.5 m (150 - 160 ft)	119 kg/m (80 lb/ft)
Metal Railings (excluding wire fence)	
Steel Railing, Type SM	95 kg/m (64 lb/ft)
Steel Railing, Type S-1	58 kg/m (39 lb/ft)
Steel Railing, Type T-1	79 kg/m (53 lb/ft)
Steel Bridge Rail	77 kg/m (52 lb/ft)
Frames and Grates	
Frame	115 kg (250 lb)
Lids and Grates	70 kg (150 lb)

RETURN WITH BID

**ILLINOIS DEPARTMENT
OF TRANSPORTATION**

**OPTION FOR
STEEL COST ADJUSTMENT**

The bidder shall submit this form with his/her bid. Failure to submit the form shall make this contract exempt of steel cost adjustments. After award, this form, when submitted shall become part of the contract.

Contract No.: _____

Company Name: _____

Contractor's Option:

Is your company opting to include this special provision as part of the contract plans?

Yes No

Signature: _____ **Date:** _____

80127

**REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS**

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ATTACHMENTS

- A. Employment Preference for Appalachian Contracts
(included in Appalachian contracts only)

I. GENERAL

1. 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.

2. Except as otherwise provided for in each section, the contractor shall insert in each subcontract all of the stipulations contained in these Required Contract Provisions, and further require their inclusion in any lower tier subcontract or purchase order that may in turn be made. The Required Contract Provisions shall not be incorporated by reference in any case. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with these Required Contract Provisions.

3. A breach of any of the stipulations contained in these Required Contract Provisions shall be sufficient grounds for termination of the contract.

4. A breach of the following clauses of the Required Contract Provisions may also be grounds for debarment as provided in 29 CFR 5.12:

- Section I, paragraph 2;
- Section IV, paragraphs 1, 2, 3, 4 and 7;
- Section V, paragraphs 1 and 2a through 2g.

5. Disputes arising out of the labor standards provisions of Section IV (except paragraph 5) and Section V of these Required Contract Provisions shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the U.S. Department of Labor (DOL) as set forth in 29 CFR 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 DOL, or the contractor's employees or their representatives.

6. Selection of Labor: During the performance of this contract, the contractor shall not:

- a. Discriminate against labor from any other State, possession, or territory of the United States (except for employment preference for Appalachian contracts, when applicable, as specified in Attachment A), or
- b. Employ convict labor for any purpose within the limits of the project unless it is labor performed by convicts who are on parole, supervised release, or probation.

II. NONDISCRIMINATION

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 and 41 CFR 60 (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 Equal Opportunity Construction Contract Specifications set forth under 41 CFR 60-4.3 and the provisions of the American 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 State highway agency (SHA) and the Federal Government in carrying out EEO obligations and in their review of his/her activities under the contract.

b. The contractor will accept as his 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, preapprenticeship, and/or on-the-job-training."

2. EEO Officer: The contractor will designate and make known to the SHA contracting officers an EEO Officer who will have the responsibility for an must be capable of effectively administering and promoting an active contractor program of EEO 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 minority group employees.

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 minority groups 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 employees referral sources likely to yield qualified minority group applicants. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish which such identified sources procedures whereby minority group 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, he is expected to observe the provisions of that agreement to the extent that the system permits the contractor's compliance with EEO contract provisions. (The DOL has held that where implementation of such agreements have the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Executive Order 11246, as amended.)

c. The contractor will encourage his present employees to refer minority group applicants for employment. Information and procedures with regard to referring minority group 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 his 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 his avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minority group and women employees, and applicants for employment.

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. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision.

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 minority group and women employees 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 his/her best efforts to obtain the cooperation of such unions to increase opportunities for minority groups and women within the unions, and to effect referrals by such unions of minority and female employees. 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 best efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minority group members and women for membership in the unions and increasing the skills of minority group employees and women so that they may qualify for higher paying employment.

b. The contractor will use best 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 SHA 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 minority and women 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 quailifiable minority group persons and women. (The DOL has held that it shall be no excuse that the union with which the contractor has a collective bargaining agreement providing for exclusive referral failed to refer minority employees.) 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 SHA.

8. 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.

a. The contractor shall notify all potential subcontractors and suppliers of his/her EEO obligations under this contract.

b. Disadvantaged business enterprises (DBE), as defined in 49 CFR 23, shall have equal opportunity to compete for and perform subcontracts which the contractor enters into pursuant to this contract. The contractor will use his best efforts to solicit bids from and to utilize DBE subcontractors or subcontractors with meaningful minority group and female representation among their employees. Contractors shall obtain lists of DBE construction firms from SHA personnel.

c. The contractor will use his best efforts to ensure subcontractor compliance with their EEO obligations.

9. 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 completion of the contract work and shall be available at reasonable times and places for inspection by authorized representatives of the SHA and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number 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;

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minority and female employees; and

(4) The progress and efforts being made in securing the services of DBE subcontractors or subcontractors with meaningful minority and female representation among their employees.

b. The contractors will submit an annual report to the SHA 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. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data.

III. NONSEGREGATED FACILITIES

(Applicable to all Federal-aid construction contracts and to all related subcontracts of \$10,000 or more.)

a. By submission of this bid, the execution of this contract or subcontract, or the consummation of this material supply agreement or purchase order, as appropriate, the bidder, Federal-aid construction contractor, subcontractor, material supplier, or vendor, as appropriate, certifies that the firm does not maintain or provide for its employees any segregated facilities at any of its establishments, and that the firm does not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. The firm agrees that a breach of this certification is a violation of the EEO provisions of this contract. The firm further certifies that no employee will be denied access to adequate facilities on the basis of sex or disability.

b. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, timeclocks, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive, or are, in fact, segregated on the basis of race, color, religion, national origin, age or disability, because of habit, local custom, or otherwise. The only exception will be for the disabled when the demands for accessibility override (e.g. disabled parking).

c. The contractor agrees that it has obtained or will obtain identical certification from proposed subcontractors or material suppliers prior to award of subcontracts or consummation of material supply agreements of \$10,000 or more and that it will retain such certifications in its files.

IV. PAYMENT OF PREDETERMINED MINIMUM WAGE

(Applicable to all Federal-aid construction contracts exceeding \$2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural minor collectors, which are exempt.)

1. General:

a. All mechanics and laborers 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 (29 CFR 3) issued by the Secretary of Labor under the Copeland Act (40 U.S.C. 276c)] the full amounts of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment. The payment shall be computed at wage rates not less than those contained in the wage determination of the Secretary of Labor (hereinafter "the wage determination") which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the

contractor or its subcontractors and such laborers and mechanics. The wage determination (including any additional classifications and wage rates conformed under paragraph 2 of this Section IV and the DOL poster (WH-1321) or Form FHWA-1495) 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. For the purpose of this Section, contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act (40 U.S.C. 276a) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of Section IV, paragraph 3b, hereof. Also, for the purpose of this Section, 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 paragraphs 4 and 5 of this Section IV.

b. 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.

c. All rulings and interpretations of the Davis-Bacon Act and related acts contained in 29 CFR 1, 3, and 5 are herein incorporated by reference in this contract.

2. Classification:

a. The SHA contracting officer shall require that any class of laborers or mechanics employed under the contract, which is not listed in the wage determination, shall be classified in conformance with the wage determination.

b. The contracting officer shall approve an additional classification, wage rate and fringe benefits only when the following criteria have been met:

(1) the work to be performed by the additional classification requested is not performed by a classification in the wage determination;

(2) the additional classification is utilized in the area by the construction industry;

(3) the proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination; and

(4) with respect to helpers, when such a classification prevails in the area in which the work is performed.

c. If the contractor or subcontractors, as appropriate, the laborers and mechanics (if known) to be employed in the additional classification 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 DOL, Administrator of the Wage and Hour Division, Employment Standards Administration, Washington, D.C. 20210. The Wage and Hour 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.

d. In the event the contractor or subcontractors, as appropriate, the laborers or mechanics to be employed in the additional 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 question, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. Said 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.

e. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraph 2c or 2d of this Section IV shall be paid to all workers performing work in the additional classification from the first day on which work is performed in the classification.

3. Payment of Fringe Benefits:

a. 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 or subcontractors, as appropriate, shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly case equivalent thereof.

b. If the contractor or subcontractor, as appropriate, does not make payments to a trustee or other third person, he/she may consider as a part of the wages of any laborer or mechanic the amount of any cost 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.

4. Apprentices and Trainees (Programs of the U.S. DOL) and Helpers:

a. Apprentices:

(1) 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 DOL, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau, or if a person is employed in his/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 Bureau of Apprenticeship and Training or a State apprenticeship agency (where appropriate) to be eligible for probationary employment as an apprentice.

(2) The allowable ratio of apprentices to journeyman-level employees 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 employee 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 listed in 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 or subcontractor 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-level hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

(3) 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 journeyman-level 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 for the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

(4) In the event the Bureau of Apprenticeship and Training, or a State apprenticeship agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor or subcontractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the comparable work performed by regular employees until an acceptable program is approved.

b. Trainees:

(1) 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 DOL, Employment and Training Administration.

(2) The ratio of trainees to journeyman-level employees on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. 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.

(3) Every trainee must be paid at not less than the rate specified in the approved program for his/her level of progress, expressed as a percentage of the journeyman-level 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

Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman-level wage rate on the wage determination which provides for less than full fringe benefits for apprentices, in which cases such trainees shall receive the same fringe benefits as apprentices.

(4) In the event the Employment and Training Administration withdraws approval of a training program, the contractor or subcontractor 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. Helpers:

Helpers will be permitted to work on a project if the helper classification is specified and defined on the applicable wage determination or is approved pursuant to the conformance procedure set forth in Section IV. 2. Any worker listed on a payroll at a helper wage rate, who is not a helper under a approved definition, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed.

5. 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.

6. Withholding:

The SHA shall upon its own action or upon written request of an authorized representative of the DOL withhold, or cause to be withheld, from the contractor or subcontractor 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, as much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainee's 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 SHA contracting officer 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.

7. Overtime Requirements:

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers, mechanics, watchmen, or guards (including apprentices, trainees, and helpers described in paragraphs 4 and 5 above) shall require or permit any laborer, mechanic, watchman, or guard in any workweek in which he/she is employed on such work, to work in excess of 40 hours in such workweek unless such laborer, mechanic, watchman, or guard receives compensation at a rate not less than one-and-one-half times his/her basic rate of pay for all hours worked in excess of 40 hours in such workweek.

8. Violation:

Liability for Unpaid Wages; Liquidated Damages: In the event of any violation of the clause set forth in paragraph 7 above, the contractor and any subcontractor responsible thereof shall be liable to the affected employee for his/her 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, mechanic, watchman, or guard employed in violation of the clause set forth in paragraph 7, in the sum of \$10 for each calendar day on which such employee was required or permitted to work in excess of the standard work week of 40 hours without payment of the overtime wages required by the clause set forth in paragraph 7.

9. Withholding for Unpaid Wages and Liquidated Damages:

The SHA shall, upon its own action or upon written request of any authorized representative of the DOL withhold, or cause to be withheld, from any monies 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 8 above.

V. STATEMENTS AND PAYROLLS

(Applicable to all Federal-aid construction contracts exceeding \$2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural collectors, which are exempt.)

1. Compliance with Copeland Regulations (29 CFR 3):

The contractor shall comply with the Copeland Regulations of the Secretary of Labor which are herein incorporated by reference.

2. Payrolls and Payroll Records:

a. Payrolls and basic records relating thereto shall be maintained by the contractor and each subcontractor during the course of the work and preserved for a period of 3 years from the date of completion of the contract for all laborers, mechanics, apprentices, trainees, watchmen, helpers, and guards working at the site of the work.

b. The payroll records shall contain the name, social security number, and address of each such employee; his or her correct classification; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalent thereof 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. In addition, for Appalachian contracts, the payroll records shall contain a notation indicating whether the employee does, or does not, normally reside in the labor area as defined in Attachment A, paragraph 1. Whenever the Secretary of Labor, pursuant to Section IV, paragraph 3b, has found 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 and each subcontractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, that the plan or program has been communicated in writing to the laborers or mechanics affected, and show the cost anticipated or the actual cost incurred in providing benefits. Contractors or subcontractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprentices and trainees, and ratios and wage rates prescribed in the applicable programs.

c. Each contractor and subcontractor shall furnish, each week in which any contract work is performed, to the SHA resident engineer a payroll of wages paid each of its employees (including apprentices trainees, and helpers, described in Section IV, paragraphs 4 and 5, and watchmen and guards engaged on work during the preceding weekly payroll period).

The payroll submitted shall set out accurately and completely all of the information required to be maintained under paragraph 2b of this Section V.

This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal stock number 029-005-0014-1), U.S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.

d. Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his/her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) that the payroll for the payroll period contains the information required to be maintained under paragraph 2b of this Section V and that such information is correct and complete;

(2) that such 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 the Regulations, 29 CFR 3;

(3) that each laborer or mechanic has been paid not less than the applicable wage rate and fringe benefits or cash equivalent for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

e. 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 2d of this Section V.

f. The falsification of any of the above certifications may subject the contractor to civil or criminal prosecution under 18 U/S. C. 1001 and 31 U.S.C. 231.

g. The contractor or subcontractor shall make the records required under paragraph 2b of this Section V available for

inspection, copying, or transcription by authorized representatives of the SHA, the FHWA, or the DOL, 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 SHA, the FHWA, the DOL, or all may, after written notice to the contractor, sponsor, applicant, or owner, take such actions 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.

VI. RECORD OF MATERIALS, SUPPLIES, AND LABOR

1. On all federal-aid contracts on the national highway system, except those which provide solely for the installation of protective devices at railroad grade crossings, those which are constructed on a force account or direct labor basis, highway beautification contracts, and contracts for which the total final construction cost for roadway and bridge is less than \$1,000,000 (23 CFR 635) the contractor shall:

- a. Become familiar with the list of specific materials and supplies contained in Form FHWA-47, "Statement of Materials and Labor Used by Contractor of Highway Construction Involving Federal Funds," prior to the commencement of work under this contract.
- b. Maintain a record of the total cost of all materials and supplies purchased for and incorporated in the work, and also of the quantities of those specific materials and supplies listed on Form FHWA-47, and in the units shown on Form FHWA-47.
- c. Furnish, upon the completion of the contract, to the SHA resident engineer on Form FHWA-47 together with the data required in paragraph 1b relative to materials and supplies, a final labor summary of all contract work indicating the total hours worked and the total amount earned.

2. At the prime contractor's option, either a single report covering all contract work or separate reports for the contractor and for each subcontract shall be submitted.

VII. SUBLETTING OR ASSIGNING THE CONTRACT

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 State. 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).

- a. "Its own organization" shall be construed to include only workers employed and paid directly 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, assignee, or agent of the prime contractor.
- 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 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 VII 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 SHA 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 SHA 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 SHA has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

VIII. SAFETY: ACCIDENT PREVENTION

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 SHA 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. 333).

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. 333).

IX. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

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, the following notice 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:

NOTICE TO ALL PERSONNEL ENGAGED ON FEDERAL-AID HIGHWAY PROJECTS

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 not more than \$10,000 or imprisoned not more than 5 years or both."

X. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

(Applicable to all Federal-aid construction contracts and to all related subcontracts of \$100,000 or more).

By submission of this bid or the execution of this contract, or subcontract, as appropriate, the bidder, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any facility that is or will be utilized in the performance of this contract, unless such contract is exempt under the Clean Air Act, as amended (42 U.S.C. 1857 et seq., as amended by Pub.L. 91-604), and under the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq., as amended by Pub.L. 92-500), Executive Order 11738, and regulations in implementation thereof (40 CFR 15) is not listed, on the date of contract award, on the U.S. Environmental Protection Agency (EPA) List of Violating Facilities pursuant to 40 CFR 15.20.

2. That the firm agrees to comply and remain in compliance with all the requirements of Section 114 of the Clean Air Act and Section 308 of the Federal Water Pollution Control Act and all regulations and guidelines listed thereunder.

3. That the firm shall promptly notify the SHA of the receipt of

any communication from the Director, Office of Federal Activities, EPA indicating that a facility that is or will be utilized for the contract is under consideration to be listed on the EPA List of Violating Facilities.

4. That the firm agrees to include or cause to be included the requirements of paragraph 1 through 4 of this Section X in every nonexempt subcontract, and further agrees to take such action as the government may direct as a means of enforcing such requirements.

XI. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

1. Instructions for Certification - Primary Covered Transactions:

(Applicable to all Federal-aid contracts - 49 CFR 29)

a. By signing and submitting this proposal, the prospective primary 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 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 primary 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 department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause of default.

d. The prospective primary participant shall provide immediate written notice to the department or agency to whom this proposal is submitted if any time the prospective primary 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," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the department or agency to which this proposal is submitted for assistance in obtaining a copy of those regulations.

f. The prospective primary 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 primary 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 Transaction," provided by the department or agency entering into this covered transaction, without modification in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

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 may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the nonprocurement portion of the "Lists of Parties Excluded from Federal Procurement or Nonprocurement Programs" (Nonprocurement List) which is compiled by the General Services Administration.

i. 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.

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.

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Primary Covered Transactions

1. The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

- a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
- b. Have not within a 3-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;
- c. 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 1b of this certification; and
- d. Have not within a 3-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

2. Where the prospective primary 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 Covered Transactions:

(Applicable to all subcontracts, purchase orders and other lower tier transactions of \$25,000 or more - 49 CFR 29)

- 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," "primary covered transaction," "participant," "person," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.
- 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.
- 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 may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.
- 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 dealing.
- 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 Covered Transactions:

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 participation in this transaction 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.

XII. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

(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 his or her bid or proposal that he or she 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

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.il.gov/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.il.gov/desenv/subsc.html>.

If you have any questions concerning the wage rates, please contact IDOT's Chief Contract Official at 217-782-7806.